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Where the Tennessee Gently Flows.

THE U. T. FARMER

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BIOLOGY, AND ITS RELATION TO A BETTER UNDERSTANDING OF AGRICULTURE.

Prof. H. A. Morgan, Director Agricultural Experiment Station, U. of T.

WITHOUT reason the subject of Biology has sometimes been announced as applying especially to a discussion of lower forms of plant and animal life. This is an unfortunate interpretation of the term, as the spirit of biological investigation is expansion and knows no limit until all of the problems associated with the life of all plants and animals have been solved.

Biology has long been of the keenest interest to that small coterie of investigators in pure science who seek knowledge for its own sake without regard to its application. In many cases the facts discovered have been practically applied, as is instanced in the recent modification and consequent strengthening of national and state quarantines relative to Texas and yellow fevers.

Within recent years the medical, dental, veterinary medical, and other professions have required more advanced courses in Biology before granting graduation certificates or degrees. If this be true of special professions, having to do with the organization of parts or individual species of animals, how much more important should the study be to the agriculturist, whose knowledge is to extend to at least a general understanding of the complicated lines of representatives of all plant and animal types.

That Biology should form a basis for agricultural knowledge is rapidly being recognized. The fundamental understanding of all branches of Biology; of the classification of biological facts; of protoplasm, its properties, functions, possibilities of differentiation; of the cell as a convenient protoplasmic unit; and of the changes taking place in reproduction and growth, are vital to a comprehensive understanding of what takes place in plant and animal development as exemplified on every farm devoted to the profitable production of plants and animals.

Thorough courses in Botany and Zoology (Biology), associated with liberal training in Physics and Chemistry, and given preparatory to the more practical and composite studies of Agronomy and Animal Husbandry, can not but widen and intensify the general agricultural horizon of the agricultural student.

It is unnecessary to enumerate the many very intimate associations and fundamental relations of Biology and the composite science of agri-

culture. The seeds of plants, containing all the potentiality of their parents; the structure, functions, habits, development, and products of common farm plants; the classification and life cycles of bacteria and fungi; the general relation of plants and animals; the structure, functions, development, conformation, and products of animals; the preparation, palatability, digestion, and assimilation of foods; incubation, gestation, and all other animal activities; and the laws governing the lives of plants and animals in their broadest sense, all have a fuller and deeper meaning when interpreted in the light of biologic science.

Since the study of Biology is essential to agricultural growth and progress, might it not be advantageous to have the elements of this science taught in the rural public schools, at least, in order that the youth of the farm may interpret nature more liberally and not live ignorant of the greater agricultural possibilities that every day surround them?

MICE IN RELATION TO AGRICULTURE AND HORTICULTURE.

THERE are hundreds of species of woods, house and field mice. Some of them are represented by millions of individuals. However, this is not unnatural when we consider how very fast they multiply. They produce from 2-6 litters of from 2-12 individuals, a year. So we can see what immense proportions they would reach if unmolested. A single pair and progeny would in five seasons amount to over 2,000,000.

They are able to adapt themselves to almost all kinds of conditions. Different members of the great mouse family are at home in the swamp with the muskrat, in the woods with the squirrel, in the fields and garden with the mole and in the barn granary, store, factory and dwelling with the rat. The diet of the family consists of a greater variety than that of man and of all domestic animals put together.

Their damage to field crops and meadows is immense. They eat the roots or gridle young fruit trees, thus killing them; they destroy strawberry plants; the seeds in the garden, hot bed or cold-frame; potatoes in the ground and many other growing vegetables. In the fall they often greatly damage beets, turnips, carrots, parsnips, celery, apples and potatoes, when piled on the ground or stored in pits. The amount of grains destroyed by mice, both in the field and in the barn and granary, reaches immense proportions. By eating the roots of clovers and grasses the meadow mice do great damage to meadows, pastures and lawns. It is estimated that an adult meadow mouse requires from 24 to 36 pounds of green matter per year. It is then apparent that the many millions that infest our country are a steady drain upon the available food supply.

In the past meadow mice—for these are the most destructive—have at times become scourges. Herodotus and Homer refer to plagues of mice. Practically every country has been subject to invasions of field

mice. As late as 1892 one occurred in Scotland that was of sufficient magnitude to justify the appointing of a committee of the British board of agriculture to investigate. Nor has the United States been free from their ravages. It is estimated that in the winter of 1902 in the neighborhood of Rochester, N. Y., the meadow mice destroyed nursery stock worth $100,000. In a Kansas apple orchard of 26,000 trees nearly 5,000 were destroyed by prairie meadow mice. Of course there is no way of estimating the immense amount of damage that they do in the United States as a whole. There is no accurate method of finding out how many more sheep, cattle and hogs we could feed if we were not providing for the legions of mice.

In this country mice—particularly meadow mice—are most numerous in the vicinity of cities and in the less recently settled portions. This fact is entirely as should be expected. Man has destroyed the balance in nature by killing the enemies of the little rodent. Foxes, raccoons, opossums, skunks, minks, weasles, crows, hawks, owls and snakes, for the most part, destroy mice habitually.

If the number of mice is to be reduced, or even kept from reaching greater proportions, their natural enemies must be protected as far as practical. Their favorite haunts—swamps and fields covered with weeds and dead grass, should be reduced as far as possible. Poison may be successfully used. The following method has given good results: One ounce of strychnia sulphate is dissolved in a pint of hot water and a pint of heavy sugar syrup is added. This mixture is stirred in one bushel of wheat until every grain is wet and let stand for about twelve hours. To prevent larger animals or birds from getting the poison grain, it may be put in the middle of short pieces of one and one-half inch drain pipe.

THE BABCOCK TEST.

A. T. Anders.

USUALLY there is little or no attempt made by the average farmer to keep an account of the milk produced. If a cow gives a fair amount of milk, she is considered a good one, whether her milk is rich or poor in butter fat. Whether a cow is flush when fresh and then dwindles to little or nothing at the end of six or eight months, or whether she gives a relative quantity all through her period of lactation, is a question that seldom interests the farmers. Some of these cows "eat their heads off" twice a year, while others return a small profit. However, as a usual thing the farmers do not know which are profitable.

A small Babcock tester and a little attention occasionally in testing samples of milk from the different cows and a record of weights taken

once a week, will teach the farmers something that will mean dollars to them.

The cost of feed and attention need not be determined in this test. Because an unprofitable cow requires as much food and care as a profitable one. The value of the cow found on the average grain, cotton or fruit farm, could be doubled in a comparatively short time by the judicious use of the Babcock test, and a sensible weeding out process. The keeping of cows on an average farm is simply a side issue, but it should have more attention than is given to it today.

It has been said that Illinois has one million dairy cows, and it is considered by noted dairymen that the value of the product of the cows would increase four millions of dollars in one year if the Babcock tester were used, and the unproductive cows taken out of the small herd and sold to the butcher, so that her offspring will not appear in the next generation.

IT PAYS TO READ.

THE cow census report of a recent creamery patrons' investigation in Minnesota, by Frank Kinsley, is rich in object lessons for any one who owns a cow.

Inasmuch as there were more Shorthorn herds reported than any other one breed we will consider that breed. They are considered of little value as a patron's cow, and especially severely criticised by dairy papers. They represent the dual purpose type, or the farmers' cow. But to show that it is the man back of the cow rather than the breed we submit these figures from the above mentioned report. We divide all owners of Shorthorn herds into two classes, readers and non-readers of dairy papers.

READERS.

No. of Cows in herd.	Per cent profit.
8 Shorthorns	10
5 Shorthorns	16
8 Shorthorns	23
8 Shorthorns	32
5 Shorthorns	31
12 Shorthorns	73
9 Shorthorns	82
7 Shorthorns	78
11 Shorthorns	22
7 Shorthorns	80
7 Shorthorns	53
7 Shorthorns	80
5 Shorthorns	14
6 Shorthorns	6
13 Shorthorns	23
11 Shorthorns	52
15 Shorthorns	17
6 Shorthorns	15
5 Shorthorns	38
19 Shorthorns	69
19 Shorthorns	43
13 Shorthorns	25
9 Shorthorns	49
6 Shorthorns	72
5 Shorthorns, loss	4

NON-READERS.

No. of Cows in herd.	Per cent loss.
8 Shorthorns	4
8 Shorthorns	20
6 Shorthorns	12
11 Shorthorns	21
14 Shorthorns	42
10 Shorthorns	3
29 Shorthorns	16
6 Shorthorns	3
10 Shorthorns	8
15 Shorthorns	13
10 Shorthorns	42
7 Shorthorns	3
18 Shorthorns	34
9 Shorthorns, gain	11

Thirty-nine herds are considered. Of these 39 farmers 64.2 per cent read dairy papers and 35.8 do not, and 64.2 per cent made a profit on the money invested in cow feed and 35.8 per cent lost money. Ninety-six per cent of all who made a profit are readers of dairy papers. Those who read averaged a profit per cow of 39 per cent and those who did not read averaged a loss per cow of 14.6 per cent. Of all the readers only one made a loss and of all the non-readers, only one made a profit.—*Successful Farming.*

THE RELATION OF DAIRYING TO SOIL FERTILITY.

(Notes on the address by W. G. Williamson, of Commerce, Ga., at the East Tennessee Farmers' Institute, May, 1906.)

THE question, what is a fertile soil? may be answered by saying it is one rich in soluble plant food and well filled with humus to a depth of at least 8-10 inches. It is a soil that will produce maximum crops under favorable conditions and better crops under unfavorable conditions than an unfertile one. It is more easily tilled on account of its better mechanical condition.

The average Tennessee or Georgia soil is poor. Georgia has an average wheat yield of less than eight bushels to the acre and Tennessee about nine and one-half bushels. This should not be the case, for New England, with land naturally as poor as our own, doubles our yield in wheat; the average yield in Germany is 26.8; and in England 32 bushels to the acre. (Yet parts of England have been in cultivation for a thousand years.)

In a single generation fertile land is cleared of the virgin forest, worn out by unscientific farming and abandoned to sedge grass and scraggy pines. Our methods of farming are at fault. This statement is supported by the fact that some farmers in the state produce 40 and 50 bushels of wheat to the acre. Moreover, they are not always the most favorably located either.

The question of soil fertility is largely one of humus content. Too many farmers are continually taking crops from their land and returning no vegetable matter or fertilizers. If land is to be built up, more humus must be returned than is taken from the soil—of course much of the total weight of any crop is produced from elements in the air and in rain water, so we need not put back as many pounds as we take off except to make the land better.

How is the humus as well as the necessary elements of plant food to be supplied, and at the same time a profit made from the land?

The most practical way is to grow crops that can be fed to live stock and return the resulting manure to the land from which the crops were taken. By growing legumes to maintain the supply of nitrogen and feeding some bought concentrates or adding some acid phosphate and potash to the soil, in addition to the manure, its fertility should be increased.

An acre will be used as a concrete illustration of what may be done by dairy farming. In the fall of the year sow one-half of an acre of good land to wheat and the other one-half to rye. In the latter part of March or in April cut the rye for hay and follow it with ensilage corn. When the wheat is matured cut and follow with cow peas. About the following yield may be expected from the acre: One ton of rye hay, one ton of

wheat straw, one ton of cow pea hay, six tons corn ensilage and fifteen bushels of wheat. The ensilage will supply the cow with 33 pounds a day for a year. There will be enough cow pea hay, wheat straw, and rye hay to give her five and one-half pounds of each per day for a year. The above constitutes a full roughage ration. In addition 1200 each of cotton seed meal and wheat bran will have to be bought.

INCOME.

300 lbs. butter at 25c	$75.00
5000 lbs. skim milk at $2.50	12.50
15 bushels wheat at 75c	11.25
Total income	$98.75

EXPENSES.

Labor: Feeding, milking, caring for cow, making butter, cultivating land and gathering crops	$15.00
1200 pounds cotton seed meal, $1.25	15.00
1200 pounds wheat bran $1.25	15.00
Interest and taxes	10.00
Incidentals	15.00
Total expenses	$70.00
Net profit	$28.75

All the crops, except the fifteen bushels of wheat, grown on that one acre, have been fed to the cow and both the liquid and solid manure have been returned to it. Making allowance for the fertility sold in the wheat and allowing one-half the fertilizing value of the concentrates to be lost in passing through the cow, there is returned to the acre all of the humus and fertilizing material taken off in the crops, and in addition, the land has been enriched by 45 pounds nitrogen, 25 pounds phosphoric acid and 11 pounds of potash. That is about as much nitrogen has been added to the acre as it contained in 2½ tons 10-2-2 fertilizer, as much phosphoric acid as is contained in 260 pounds and as much potash as in 550 pounds.

Mr. Williamson has sold no other than dairy products and wheat from his farm, yet he says that dairying may be combined to advantage with any other kind of agriculture. Cotton alone, for instance, destroys the fertility of the land. But by combining cotton growing and dairying the fertility of the soil may be maintained, and a large yearly net return received. For every work horse kept on a cotton farm there should be eight cows. If they be well fed and all of the manure, both liquid and solid, be saved there should be as much cotton grown as without cows and, in addition, there would be the income from the cows to swell the net returns from the farm products.

Mr. Williamson knows that all of the liquid and solid manure can not be returned to the acre but that a very large percent can. Moreover he places a low estimate on the fertilizing value of the concentrates that pass through the cow. We think he has put the selling price of butter and wheat rather low for first class products and has made a liberal allowance for taxes, interest and incidentals. On the other hand $15.00 seems too little for labor.

THE IMPORTANCE OF LIMING.

Prof. C. A. Moores, Agronomist at University of Tennessee.

IN some recent experiments by the University of Tennessee Agricultural Experiment Station a marked increase in yields resulted from quicklime applied at the rate of about 2000 pounds to the acre. The crops especially benefited were alsike clover and cowpeas.

The conditions under which the liming was most highly beneficial are, however, noteworthy. The soil used was a light clay loam which, so far as known, had never received much, if any, manure or fertilizer. The tilth was good, as the land had not been in a cultivated crop for some years. A chemical analysis showed the presence of fair amounts of all the important elements of plant food, and the excellent crops of corn, wheat, cowpeas, etc., proved the correctness of these conclusions.

Fertilizer experiments including lime gave, however, most interesting results. All the crops tried gave increased yields from applications of either acid phosphate or bone meal and, in the case of wheat, nitrate of soda and other forms of nitrogen when used in connection with the phosphates proved valuable. One-half of all the experimental plats were limed; and here appeared the most striking effect, in particular where either acid phosphate or steamed bone meal had been applied. The unlimed alsike clover was practically a failure even where manured quite heavily. On the other hand, the limed clover was a decided success in every instance save one, which was where no phosphate had been used. In short, the liming and the phosphating did best only when carried on together.

To the surprise of all who visited the field, liming affected the color of the cowpeas to such an extent that the rich dark green of the limed cowpeas could be distinguished from the light green of the unlimed for a distance of several hundred yards. But the beneficial results were not limited to a mere show of color, for the yields of both vines and fruit, especially the latter, were greatly increased. Here again the combined use of lime and phosphate gave the foremost yields. And the good effects are by no means over; for does not a good crop of peas turned under, as in this case, promise a good crop to follow?

Without doubt liming should be practiced more than it is, and over a large part of the state phosphating and liming would be expected to go hand in hand, especially wherever the application of phosphate has been found profitable.

The indications are that what so many soils which have been fertilized and cropped in wheat year after year, need is a good dressing of lime followed by a good crop of cowpeas turned under.

AN UP-TO-DATE FARM.

L. R. Neel, '07.

SOME of the fences are whitewashed and all are in good repair. The fields, creek banks and fence rows are comparatively free from brush and weeds. A macadamized road, shaded by a row of trees on each side, leads to the farm house.

The farm buildings are in good condition. There is a comfortable dwelling, a large painted dairy barn, and all necessary cribs, granaries, etc.

The owner keeps Jersey cows, sells the butter and feeds the skim milk to hogs—thus keeping practically all of the fertility on the farm. He gets full value—of course there are some unavoidable losses—from the manure by bedding his cows in the barn with straw, by bedding the barn lot and hog pen and by allowing the cows to graze in a field which he cultivates occasionally. At frequent intervals throughout the year, he hauls the manure to the parts of the farm where it will do the most good—thus leaching and loss by heating are practically avoided.

On this farm a regular rotation of crops is practiced. The rotation is corn, wheat, wheat, and timothy and clover for two or three years. The owner uses manure for the corn crop, principally acid phosphate for the wheat, depending upon the clover for nitrogen and his clay soil for potash. He has used lime with his wheat and got good results in a better "stand" of clover. He has tried alfalfa with a moderate amount of success and believes it will succeed in East Tennessee if the land is free from weed seed, is rich in plant food and vegetable matter and is supplied with lime.

The evolution of that farm is most interesting. About 25 years ago, when he came in possession, his land was like that on so many Tennessee farms, "worn out," "cropped to death." On a particular field he has raised the yield of from 20 bushels to the acre to 100—the season was very favorable and there was an unusually large number of plants per acre when the exceptional yield was made.

This year he has corn on a hill field that should yield 45 or 50 bushels to the acre and more in a comparatively level field that should make in the neighborhood of 75 bushels. He is not proud of his wheat yield, but makes an average of about 20 bushels to the acre.

It is interesting to see his hill fields which he cultivates regularly, free from gullies—but you don't have to go far to find them on neighboring farms. However, there are some very simple reasons why his fields do not "wash." His rotations are short, so the soil does not get entirely free from grass and wheat roots which help to hold the particles together. By keeping the land well tilled and rich in humus, he greatly increases the water holding capacity of the soil. So there is a much smaller amount of water to "run off" the fields. As a last precaution against washing

he cultivates strips very much longer than wide along the hill. Both above and below the tilled portion there is grass.

As a result of this common sense farming, based, in a large measure, on scientific truths, the farmer has both for his family and live stock more attractive and comfortable homes. He has given his children the advantages of higher education and is the most active factor in public enterprises in his community.

SALAD ONIONS.

W. F. Henders, '09.

THE Egyptian Salad onion is very hardy, enduring the hardest of winters without being permanently injured. The best time to set onions is in the autumn from August to October. It is very essential that they be set in well prepared, rich soil. There is no danger of getting it too rich as all the growth is to be made in the fall. In setting them in the field the soil should be prepared on a level. A furrow should be made as deep as possible with a narrow shovel or one-horse plow. The rows are laid off from 15 to 18 inches apart. It is better not to fill the furrows when first set, as it puts the onions too deep. After they are up the dirt can be gradually worked to them until the last cultivation when it is well to ridge them up. The object in this is to get as much white stem as possible as this adds to their sale value.

About two cultivations are all that is necessary in the fall. They are then ready to be ridged up and left for the winter. They need no covering or mulch during the winter.

The "sets" consist of two parts known as top and bottom "sets." The bottom "sets" are supposed to be the more valuable. Unlike the globe onions the Salad onions do not make any bulb, growing a straight stem until ripe. The larger bottom "sets" may be divided and should be set about four inches apart in the row. The top "sets" grow in clusters, on top of the seed stem. These bulblets are separated and one onion set in a place about two inches apart, as they do not multiply like the bottom "sets."

The onions need no protection during the winter. They will begin showing a new growth the first warm days in March when they should soon be ready for use. They are suitable for the market or table until the seed stem is nearly grown. So they may be marketed through a period of several weeks.

As these onions are set in the fall after the main vegetable crops are off and are due in the spring before most crops are ready to plant, we urge a general trial of them. Since they come in so early in the spring the price is usually very remunerative. Some gardeners make a net profit of from $100 to $200 per acre on this crop.

The larger towns and cities of the South afford a market for large quantities of Salad onions. Furthermore a good profit may usually be made by shipping to cities of the North.

WINTERING APPLES.

By L. R. Neel, '07.

MANY people in Tennessee are unable to keep apples through the winter. This should not be the case, for some farmers in the state keep apples through March without cold storage. The keeping qualities of apples is governed by certain conditions, among which are climate, variety, soil conditions, harvesting and place of storage.

Latitude and altitude both, in a large measure, determine the date of ripening and consequently the wintering qualities. Apples grown in New York or on the Smoky Mountains will keep longer than the same varieties grown in the lower portions of Tennessee.

The variety has much to do with the keeping qualities. The following list should furnish a succession from September until April or May, if properly handled. Grimes' Golden, Jonathan, York Imperial, Northern Spy, Ben Davis, White Pippin, Baldwin, Stark, Ralls Genet, Wine Sap and Yates.

It is asserted that the character of the soil affects the longevity as well as other qualities of the fruit. Apples grown on a clay soil are said to keep longer than those produced on a sandy or gravelly soil. Also it is claimed that those grown on sod keep longer than apples grown under clean culture.

The harvesting of apples has a great deal to do with their keeping qualities. The colored varieties should be allowed to attain their color before being gathered. The seeds should be plump and black and yet the flesh firm. With the exception of color, the same rules will hold good for green varieties. They should be picked and not pulled. That is the stem should not be broken but detached from the fruit spur where nature severs the connection. The apples should be handled as carefully as eggs, should be cooled down to as nearly the temperature of the storage room as possible and then put immediately in there.

Lastly, comes the place of storage. Here is where so many fail. Practical fruit men and experiment stations have determined that apples, to be most successfully preserved in the green condition, should be kept at a uniform temperature of about 33 degrees Fahrenheit. This temperature can not be obtained without ice or chemical cooling. But any farmer can approximate it nearly enough to have good success in wintering apples.

The building described below has given excellent results as an apple house. It is located on a northern exposure—the temperature could be further reduced by utilizing shade trees. The studding is covered both inside and out with sheathing paper. The inside layer of sheathing paper is covered with matched boards, the outside with siding and the space between the walls filled to the roof with sawdust. Next to the inside

sheathing boards is set another row of studs. These are covered with sheathing paper and matched stuff. The space thus formed is left empty. The floor, ceiling, and interior partitions are constructed on the same principle. When the outside temperature is cooler than that in the storage room the doors and windows are left open unless there is danger of freezing.

Some apple houses have the following system of ventilation: One flue passes through the center of the ceiling and roof, or there may be similar flues at each end of the room. Then a pipe under ground to the depth of seven to nine feet passes from the center of the storage room floor to a distance of 100 to 500 feet where it comes to the surface. This system of ventilation affords a circulation of air which is approximately the temperature of the ground at the depth of the pipe. Exactly how long this pipe should be has not been determined.

The fruit should be stored in comparatively small boxes—say a bushel—so they may be handled without bruising and so the pressure will not be so great on the bottom layers. Provision should be made for circulation of air among the boxes.

In New York some varieties of apples have been kept into July, in the house described. Likely the same varieties would, in Tennessee, last until June if handled in the same manner.

TETANUS, OR LOCKJAW.

(Notes taken in a class room lecture on Veterinary Science.)

TETANUS is an infectious disease due to a bacillus or germ belonging to the drumstick type. It is very prevalent, occurring in practically every country and affecting all species of warm blooded animals. Horses, mules and cattle, in the order mentioned, are the most susceptible. Man is frequently the victim of the disease. Dogs and chickens do not readily contract it.

The bacilli are anaerobic, that is they grow and multiply only when air is excluded from them. They remain stationary at the point of infection, producing their ill effect by means of a toxin. This poison is spread to the different parts of the body along the nerve trunks and through the circulation. It acts upon the motor nerves thus causing a continuous contraction of the muscles.

The germ must gain entrance into the tissues of an animal where the air will be excluded, before it can do any harm. But their spores (the seed form of the bacilli) are so numerous about barns that a slight wound may result in a case of lock jaw. It is estimated that every tablespoonful of barnyard surface soil contains a Tetanus spore. Nail wounds, wire cuts,

and in fact any condition that would afford an entrance for the germ, are favorable for the development of the disease.

SYMPTOMS FOR THE HORSE.

In from 9 to 21 days after infection with the Tetanus bacillus, the animal should show some of the symptoms of the disease which are as follows: They are at first local and then general—the limb or part of the body where the germ gained entrance will be affected first. The animal becomes nervous, holds his head in a stiff position, ears erect, and has a stilted gait. He becomes bow-legged in hind limbs, holds his tail high and stiffly. The nictitous membrane protrudes over his eyeballs. The movement of the jaws are difficult and may become impossible. Respiration is difficult, short and jerky. The pulse is normal at first, but becomes

Short Course Students of 1904 Judging a Horse.

accelerated as the disease advances. There is at first no fever, but it runs up just before death. The symptoms for other domestic animals are very similar, except that in cattle the jaws are locked more tightly.

If the afflicted animal is to get well, the symptoms usually begin to abate in 12 to 15 days. He may entirely recover in a month. Death usually occurs in 10 to 12 days, though the course of the disease is some times very short—two to three days. A horse that has had a case of lockjaw and has recovered, is immune for several years.

PREVENTIVE TREATMENT.

When in man or domestic animals a wound is made that might be infected with the Lockjaw bacillus, it should be opened up, aerated and disinfected with carbolic acid or creolin. If the wound is very dangerous and the animal valuable, the preventive antitoxin should be used. This

drug can usually be obtained at up-to-date drug stores. Full directions come with each dose which costs seventy-five cents. But it should be borne in mind that this drug is to be used between the time of infection and the appearance of the first symptoms.

CURATIVE TREATMENT.

In many cases no remedy will avail. The mortality is 50 to 90 per cent. Open up the place of infection so as to let the air in. Cut out the surface flesh or horn of the entire wound and apply a mixture of equal parts of carbolic acid and iodine. If the animal is excitable give a purge. Give morphine, opium or bromides to quiet him. Chloroform is used in man and sometimes in domestic animals. Put the patient in a dark stall. Allow no one about him except attendants. Do not exercise him for that exaggerates the disease. Use short bedding that will not tickle his legs. Feed the animal oatmeal gruel, bran slop, cut hay and keep a bucket of water before him all the time.

A curative antitoxin is on the market but is expensive and not very effective.

OPPORTUNITY FOR AGRICULTURE IN TENNESSEE.

V. S. Bright, '07.

THE State of Tennessee is capable of producing a greater variety of agricultural products than any state north or south. The counties bordering the Mississippi river rival Arkansas in the production of cotton while throughout the state the cereals flourish and all kinds of live stock thrive.

In 1900 the total number of farms in Tennessee were 224,628 which was more than three times as many as in 1850 and 28.8 per cent more than in 1890. In 1850 the total value of these farms was $53,030,150 and in 1900 they had reached the grand total of $265,150,750. The value of farm buildings in 1900 was $63,136,960, and of farm machinery $15,232,670. The total value of farm products for 1904 was $106,166,440 of which 33.4 per cent were animal products and 66.6 per cent were plant products which was equal to $70,750,242. In 1905 Tennessee farmers used 400,000 tons of commercial fertilizer besides the barnyard manure. This is progress, but many of our farmers have just gotten aroused to the fact that the soil can be robbed of its fertility and that in some way a portion of the plant food that has been removed in growing a crop must be replaced or else the land will steadily become exhausted.

What does a rich farming country mean? It means better corn, cotton and wheat crops. The pulse of American prosperity is not determined

by the steel output or manufacturing, but by the corn and cotton crop that directly feed and clothe the people. We all know unless the farmer is prosperous all other industries must sooner or later languish, for a good corn crop means money in the farmer's pocket to purchase more luxuries; a good crop of corn means more fat beeves and hogs for market, thus greater demand for cars and engines and men to operate them.

The Tennessee farmer is the most fortunate of all farmers, for in case of a failure of one crop he has recourse to a number of others. Take for instance any region where one crop is grown to the exclusion of other crops and its fortune is imperiled every year, for a failure in the harvest means a financial crisis for the farmer.

The average young man believes that success in life can only come to him by entering some industrial field; that agriculture is a circumscribed profession, hedged about with difficulties that can not be overcome, and offering but limited opportunities for the development of his natural powers; such an idea is utterly false. No young man need hesitate in choosing agriculture for a profession under the misleading opinion that it has no future or that it is without its compensations.

Some examples bearing out the assertion just made will not be out of place. The corn crop of the United States in 1899 was grown on 94,916,-911 acres. The yield was 2,266,440,217 bushels, and the total value was $828,258,326. What an enormous amount of labor must have been required to grow and harvest this crop, yet we have said that it measures the pulse of American prosperity. The question then arises, have we reached the limit of corn production? Are our American farmers growing the most desirable varieties of corn? Can't we increase the yield in some way without any further expenditure of labor and fertilizers? The successful farmer must face these questions sooner or later, and unless some action is taken the time is not far distant when we no longer can produce as much corn as we can consume. The fact has been clearly shown that the yield of corn may be increased 15 to 25 per cent per acre by the proper selection of seed and better tillage. There is no limit to opportunities for judicious breeding. In the state of Illinois there has been a company organized, for no other purpose than to breed better seed corn for the farmers of that state. Hundreds of young men that work in the shops and factories might go into the breeding of corn on a scientific basis and receive a handsome remuneration and be public benefactors as well. What has been said of corn can be said of wheat, oats, barley and potatoes.

In the last fifty years the live stock industry has been developed to a marvelous degree of perfection. In 1900 the value of live stock on the farms and ranches amounted to $3,390,000,000. The slaughtering and packing of animals and animal products has developed one of the greatest industries in the world. There are received annually in the stock yards of Chicago three million head of cattle, seven million head of hogs and four and one-half million head of sheep. When these animals are slaught-

ered and ready for market they are worth $390,000,000. Thus we see that fortunes are being made by men who are engaged in breeding and rearing domestic animals. But the breeding of plants has not reached such a state of perfection as the breeding of live stock. In fact the breeding of plants has just begun, and it can be safely said that there are as great opportunities offered to the plant breeder today as were offered the breeder of live stock fifty years ago. Take for example Tennessee's leading crop, which is corn. In 1899 3,374,574 acres were devoted to the culture of corn and the yield was 67,307,574 bushels. The value of the crop was $28,059,508, which was more than one-third the value of all farm crops. Assuming that the acreage for 1905 was 3,374,574 acres, an increase of one bushel per acre would mean 3,374,574 bushels, which at a value of 65 cents per bushel, would be worth $2,195,573. Those who have studied the culture of corn know that it is not impossible to increase the yield five bushels per acre, and in view of the large money value it would represent there is no reason why the farmer should not put forth every effort to increase the yield of his corn crop, especially if he can do so with a small expenditure of money.

SHEEP IN TENNESSEE.

TENNESSEE has one sheep to 78 acres of land or about 1½ to each farm. This seems like too small a ratio for the state. Farmers in other parts of the country, and even in our own state, find them one of the most profitable kinds of live stock.

There seems to be little danger of over-production of sheep in this country. In 1905 the entire United States exported only 301,313 and imported 189,942. In 1904 our imports of wool amounted to 249,135,746 pounds.

Believing that a pretty thorough study of sheep husbandry might be helpful we hope in the next six or eight issues to discuss the following subjects in their relation to successful production of mutton and wool: Breeds, climate, locality, feeds, shelter, disease and market.

We shall greatly appreciate the experience and methods of the farmers in the state who have been successful and who have made failures in growing sheep.

EDITORIAL.

The U. T. Farmer makes its bow to the public modestly, with some trepidation and much hope of success. Primarily the organ of the students of the College of Agriculture of the University of Tennessee, it has the cordial co-operation of the faculty, and its purpose is to establish a closer relation between the University and the farmers of the state.

The agricultural students of the University have found inspiration and help in their studies and in the associations formed here. They believe that the opportunities afforded by this institution are not generally appreciated by the people, because not known. Every farmer who has visited the Experiment Farms of the University of Tennessee, has been impressed with their immense usefulness and has become a friend. The students brought into far closer relation with the institution than the casual visitor, are its friends and champions. They wish to share with their fellow farmers something of the advantages they enjoy, and to this end the U. T. Farmer has been established.

It is the supreme ambition of the U. T. Farmer to encourage the greatest possible production from the soil and to stimulate the highest ideals of farm life.

OUR ADVERTISERS.

The U. T. Farmer will not knowingly accept the advertisements of any but reliable firms or individuals. It recommends to all of its readers the advertisements found in its columns. You will do both them and us a favor and will make your own interests safe by giving them your patronage and telling where you saw the advertisement.

A MESSAGE TO AMERICAN THINKERS.

In a recent address at the Minnesota State Fair at St. Paul, Mr. James J. Hill, president of the Northern Pacific & Great Northern Railroads, voiced what the New York Herald regards as "One of the most notable contributions ever made to American economic science."

Mr. Hill's message should mark an epoch in the thought of the country. We are called from a selfish and narrow consideration of immediate wants to a broad and altruistic provision for the next and succeeding generations.

"The highest conception of a nation, is that of a trustee for posterity." At our present rate of increase our population in 1950 will be 204,041,223. This country in 50 years will have to feed, clothe and shelter nearly three times as many people as at present. The tillable public lands have almost disappeared. The land yet to be reclaimed, if at once made available, would supply the needs of the increase in population for only three years.

At the increasing rate of consumption, the year 1950, as far as our

own resources are concerned, will be practically an ironless age. The best coal mines will have been exhausted, so that many industries that now flourish will have to use some other fuel or close. Our natural forests will have been destroyed unless there is a radical change from present methods. "The treasury of our future is being despoiled to swell the rapidly growing riches of the day."

The soil is the one asset, that does not perish, because it contains in itself, if not abused, the possibility of infinite renewal. "All the life that exists upon this planet, all the development of man from his highest to his lowest qualities, rest as firmly and as unreservedly upon the capabilities of the soil as do his feet on the ground beneath him. A self-perpetuating race must rely upon a self-perpetuating means of support."

In some parts of the country the productivity of the land has declined from one-third to one-half or even more. "Frankly and without shame, this is attributed to the 'wearing out' of the soil as if the earth were a garment to be destroyed by the using. If the earth, the mother of humanity, is to 'wear out,' what is to become of the race?"

Other countries, under the stress of a dense population, have by intensive farming, reached a production that to us seems incredible. Belgium produces enough food, exclusive of exports, to supply the wants of 490 inhabitants per square mile of cultivated land. Japan has a cultivated area of 19,000 square miles and a population of 45,000,000 people of which 30,000,000 earn their living from the soil.

The American farmer should learn a lesson from the agriculturists of other countries and prepare to feed "The army of another 100,000,000 people marching in plain sight toward us, and expecting and demanding that they shall be fed." There are three essentials that should be embodied in American agriculture to make it worthy of the name. They are intelligent rotation of crops, maintaining of fertility of the soil through stock growing, and intensive tillage.

Mr. Hill's address is attracting the attention of the press throughout the country. His opinions, supported by statements and statistics, have received both favorable and unfavorable criticisms. At least his assertions regarding the agricultural situation practically remain unassailable.

At its thirty-first session, held May 15-18, 1906, the East Tennessee Farmers' Convention passed resolutions appreciative of the splendid work of State Commissioner of Agriculture W. W. Ogilvie, Director Morgan, of the Experiment Station, and President Ayres, of the University.

The following resolutions will, we are sure, meet the hearty approval of all friends of the University:

Recognizing the importance and value of the work of the State University and the Experiment Station to the farmers of the state, and the imperative need of liberal appropriations and assistance, and the fact that the appropriations in the past have been far from adequate, and,

Whereas, the State University of Tennessee has received from the state smaller appropriations than the state university of almost any other state;

Resolved, That it is the sense of this Convention that liberal appropriations by the Legislature should be made to the University, commensurate with her needs, and as liberal as the resources of the state will allow.

Resolved, That we commend to the Legislature a thorough investigation of the needs of the University, and, in the interest of the prosperity and progress of the agriculture of the state, an appropriation that shall place the University in position to serve more adequately the needs of the farmers.

Resolved, That we endorse and commend the agricultural courses at the University, and recommend particularly the short course in agriculture to every farmer, young or old, who is in position to take advantage of an exceptional opportunity.

Resolved, That it is the sense of this convention that an agricultural education is as important to the farmer as special knowledge and training is in any profession; that a knowledge of the soil is as important to the farmer as a knowledge of fundamental principles is to the lawyer, or a knowledge of anatomy is to the physician; and that farmers are prosperous in direct proportion to the amount of special knowledge and intelligence they put into their work.

THE AGRICULTURAL CLUB.

The present Agricultural Club was organized April 17, 1906. Its object is to stimulate greater interest in agricultural subjects and to more intimately and effectively unite the students of agriculture.

The boys are getting a great deal of good as well as much pleasure from the Club.

The present officers are:

L. R. Neel ..... President.
A. T. Anders ..... Vice-President
Louis Christman ..... Secretary and Treasurer

The first meeting of the Club this session was a social gathering at the home of Prof. Keffer, where everybody had a good time.

In the evening of October 2, the Club had its first regular meeting of the session. The program consisted of able talks by President Ayres and Rev. Mr. Ogden of the city.

Dr. Ayres assures the Club that he is at its service in every legitimate undertaking.

UNIVERSITY NEWS AND LOCALS.

Every year the University of Tennessee strengthens its teaching force in agriculture, and the sciences related thereto. This year the Department of Botany has been enlarged by the addition of a course in Bacteriology, with Mr. Maurice Mulvania, of the University of Nebraska, as instructor. A very complete laboratory for instruction and investigation in bacteriology has been provided.

Mr. E. C. Cotton, a graduate of the University of Ohio, has been secured as second assistant in Entomology. He has already had valuable experience in his special line in the University of Louisiana.

Mr. H. H. Hampton, a graduate of Tennessee, has come back "home" and is now assistant agricultural chemist.

Mr. J. N. Price, graduate of the University of Missouri, has succeeded Mr. Barnes as dairyman. Mr. Barnes is traveling for the National Department of Agriculture in the interest of siloes. But we are glad that he makes his headquarters in Knoxville.

With thirteen last year's students returned (four Seniors and nine Sophomores) and twelve Freshmen matriculated, the Agricultural Department opens the session of 1906-1907 with flattering prospects. The U. T. Farmer extends a hearty welcome to its new friends, the Freshmen.

A milking machine has been established at the University Farm. The dairymen may come and see it in operation and decide whether they want one or not.

"Sore Mouth" has been prevalent in the dairy herds in this vicinity. Some of the cows in the Experiment Station herd contracted the disease but there have been no serious results.

The two Tamworth hogs on the Farm are attracting a great deal of attention.

The season has not been favorable for the production of honey. So there has been but little surplus to take from the apiary on the Farm. Though Mr. Bently says most of the colonies are in good condition for wintering.

The value of the Experiment Station has been increased by the addition of a poultry department. There are now eight varieties of chickens, several incubators, a brooder and other fixtures necessary for experimental work.

Corn cutting on the University Farm was begun August 15 and was ended when the frost killed the last planting (July 21 and 26). The U. T. Farmer will give in a later issue some interesting results as to varieties of corn, time of planting, number of plants to the acre, and fertilizers used.

Prof. Bain has cotton growing on the University Farm. The plants are quite a novelty here.

The University Fruit Farm had its first peach crop this year. There was a succession of peaches from June 1 to September 15. Some of them were very fine and commanded a good price on the Knoxville market. There were also some very fine quinces, some pears, plums and a heavy crop of grapes.

Over a hundred varieties of strawberries ripened on the Fruit Farm last spring. They afforded a very valuable object lesson to students and the farmers who visited the station during the East Tennessee Farmers' Convention.

FORMER STUDENTS.

The U. T. Farmer wishes to keep in as close touch as is possible with all ex-students who have taken any work in agriculture at the University of Tennessee. So we urge all former students to let us know what they are doing and to co-operate with us in getting information about their classmates at the University of Tennessee.

'04, B. S. A.—Mr. R. P. Hite, in partnership with his father, is engaged in stock breeding on the "home place," near Gallatin, Tennessee.

'05, B. S. A.—C. L. Davis spent last session doing post-graduate work at the Iowa State Agricultural College. He now has a very good position teaching in Arkansas.

'05—Mr. Jesse Rainey is engaged in truck gardening and fruit growing at Columbia.

'04—Mr. Milton Jarnigan, after a year at Wiseonsin University, took a B. S. A. at the Iowa State Agricultural College and is now assistant in animal husbandry in the Virginia Experiment Station at Blacksburg. "Yearling is sure of success."

'04—"Big" Balthis returned to his home in Iowa, and will complete the agricultural course with major in forestry at the I. A. C. the coming Christmas. He has been guard on the Ames team for two years past.

'06, B. S. A.—Mr. W. N. Garret is now assistant in plat work on the Tennessee University Farm.

'01, Short Course—Mr. Eugene Converse left the Experiment Station, where he had worked for several years, to accept a position on a large stock farm near Knoxville. The U. T. Farmer wishes him success.

'01, Short Course.—Mr. W. A. Campbell is now farm foreman on the Experiment Station. He has been on the Farm for several years.

'02, Short Course—Mr. Clarence Symns is successfully managing his stock farm at Karn, W. Va.

There are bright prospects in athletics this year. There is a "husky" "bunch" out working hard and much is expected of them.

The new addition to the mechanical building is about completed. It is a well planned and substantial addition which has been badly needed. We are glad the Engineering students are not to be so crowded this year.

The annual Cane Rush was "pulled off" Saturday night, October the 6th, and resulted in a victory for the Sophomore Class—this class won last year. Nevertheless, the victory this year was no "walk over." The Freshmen made a good "showing."

About 120 Freshmen have enrolled in all departments of the University.

SCIENCE IN FARMING.

There has been and is yet a great deal of prejudice against the word science among some farmers. It is a good word, simple and most reasonable in its application. Let us take a good definition of the word and see if all who till the soil from him who uses the simplest methods to him who is most up-to-date, do not to some extent use science in their work.

"Science is knowledge gained and verified by exact observation and correct thinking."

Any farmer will tell you that he does not plant his corn in the shade of trees, does not grow roasting ears in the cellar, and does not broadcast corn for the grain. Now, the so-called scientific farmer has also discovered that plants need sunlight, but he goes a little further and learns some of the changes that the sunlight causes in plants. But what is more important he begins to experiment and finds how much sunlight the corn should have to make the largest yield per acre—that is he finds how many plants he should grow on an acre.

It is a fact, established by practice and observation, that a cow fed on timothy hay, alone, will give but very little milk. The average farmers are aware of this fact and use some other feed if possible. They find that clover hay and corn and oats is a very good ration for a milk cow. Here again the mind of the scientific farmer has fallen in the same channel. But the scientist goes deeper. He finds that timothy hay is very low in protein—a necessary constituent of milk—and that clover hay and oats are comparatively high in the same substance. So he mixes the two kinds

of hay and grain together until he has a balanced ration—that is he will feed those things that experiments have proven to be the most profitable.

Yes, all of us must obey some of the laws of science to be able to exist on the farm and the more of these laws we obey, the happier and more successful we should be.

AGRICULTURAL EXPERIMENT STATION BULLETINS.

A. T. Anders, '07.

Every agricultural experiment station in the United States issues bulletins which are distributed among the farmers and those who take an active interest in agricultural subjects. Through these bulletins the Director of the Experiment Station has an opportunity to give specific account of the experimental work under his supervision.

The information that these publications contain is usually very valuable and should be a great help to the intelligent farmer who is willing to read and be taught.

The United States Department of Agriculture is continually "getting out" valuable bulletins and circulars. These are listed in the monthly and yearly list of publications. By sending his name and request to the Secretary of Agriculture, Washington, D. C., any farmer may get, regularly, the Monthly List of Publications and by writing once per annum, he may get the Yearly List of Publications available for free distribution. From these lists he may make his selections.

CONTENTS—NOVEMBER, 1906

Subscriptions, $1.00 per session—9 numbers, 15 cents a copy, to be paid in advance.

Contributions from members of the Club and from the Alumni of the Agricultural Department are especially requested.

Advertising rates made known on application. We aim to advertise reliable firms only.

Address all communications to

U. T. FARMER, University of Tennessee, Knoxville, Tenn.

Shetland Ponies at the State Fair, Property of W. W. Ogilvie, Lewisburg.

THE U. T. FARMER

Vol. 1. NOVEMBER, 1906 No. 2

THE SHORT COURSE IN TENNESSEE AND ELSEWHERE.

THE first short course in agriculture of which the writer has knowledge was offered in the University of Minnesota in 1886. Students were invited to spend the summer vacation on the university farm, and learn by doing. No lectures were given, and whatever was gained by the students was acquired by absorption—association with the professor and his foremen. Seven men came, but the plan did not work out very well; it was difficult to see wherein the student's opportunities differed from the laborer's on the farm. The Minnesota short course from

SHORT COURSE CLASS CORN JUDGING.

such a beginning has developed into the strongest agricultural school—as distinguished from a college—in the country. It is in fact a preparatory school for the Agricultural College of the University, but it differs from all other preparatory schools in including strong practical courses in the various branches of agriculture. And its graduates after two years residence are a force for good in the improvement of Minnesota farming.

In Wisconsin also the university has a strong two-year course, and in that state the agricultural high school plan has proved very popular.

But the short course idea as it is understood in Tennessee—brief courses, which may be completed in a few weeks during the season of

least pressing work on the farm—has been most popular in the Iowa Agricultural College. Last season 550 students attended the short courses in that institution, and the growing popularity of the work is proof of its high value.

Purdue, the state agricultural college of Indiana, had 102 short course students last year, and in the University of Missouri 69 students were enrolled in the short courses of 1904.

Tennessee comes next in the list, and, all things considered, the showing is not discreditable to the state. It is only reasonable to hope, however, that the enrollment for the 1907 short courses will far surpass that of any previous year. The great popularity of farmers' institutes throughout the state indicates a quickened interest in improved agricultural methods. The work of Professors Morgan, Mooers, Gilchrist, and other members of the faculty in the institutes has made the people familiar with the university and its work, and has received general public endorsement. Every man who has attended the short course in previous years is an enthusiastic advertiser of this important university work.

"The people have neglected the preservation of the soil."

THE SHORT COURSE IN AGRICULTURE FOR 1907.

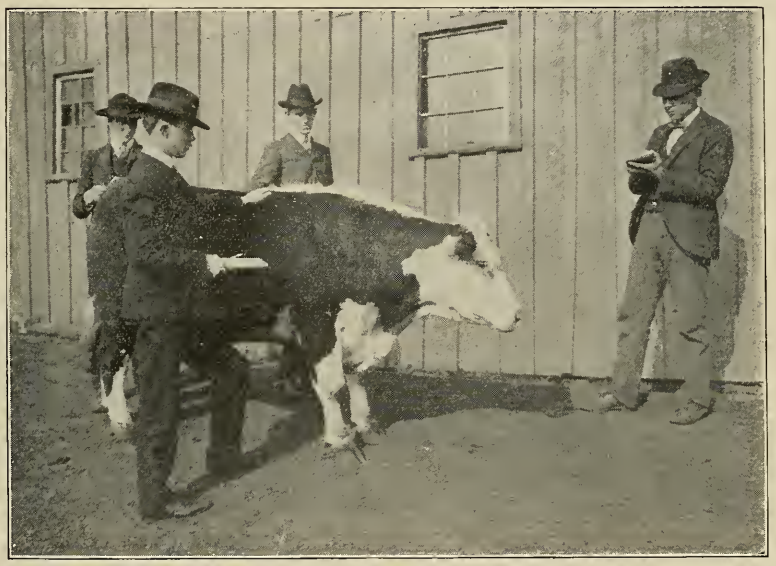
The University of Tennessee will institute a radical change in the Short Course in Agriculture for 1907. Heretofore all short course students have been expected to take every subject offered, whether it was of especial interest or not. The next short course has been so planned that a man who wants to study in a single line of farming may devote all his time to that subject for a period of two weeks; as much work being compressed into this brief period as formerly required ten weeks to complete. The course has been divided into four groups, each of which is dominated by one line of instruction, which is supplemented by lessons in closely related subjects.

The course opens with General Agriculture, from January 2 to January 14. During these two weeks farm crops, soils and fertilizers are the principal lines of instruction, with lessons on insects, plant diseases and weeds. Especial attention will be given to corn judging and practice with fertilizers and soils. The student whose interest is confined to this line of agriculture may devote eight hours daily to its study, and the large library can occupy the balance of his waking hours. He will receive as much and as thorough instruction in the subjects mentioned as is ordinarily taught in a ten-weeks term; so if he has only a little time to devote to study he will find the two weeks very profitably spent, and can return home after this brief absence ready for better work next season.

From January 16 to January 28 Animal Husbandry will be taught. Score-card judging, in which the animal is gone over point by point, and the merits and defects carefully noted, is the method employed. Horses, cattle, sheep and swine are judged in this way, half of each day being devoted to this work. With it are lessons on the characteristics of the leading breeds of live stock, on veterinary medicine, on feeds and feeding and on breeding. Abundant practice is given in computing and mixing rations and in feeding. Probably there is as much need of a perfect knowledge of these important details of animal husbandry as of anything connected with farming.

From January 30 to February 11 three principal groups are offered; one exclusively for women, and the others for both men and women.

The course in Home Economics has been planned with especial refer-



Judging a Beef Animal, University of Tennessee.

ence to the needs and interests of farmers' wives and daughters. It includes lessons and practice in cooking and sewing, with lectures on sanitation and hygiene, dairying, lawn and garden, insects, plant diseases and weeds. The whole realm of women's interests is thus touched upon and it is hoped there may be a large attendance of the ladies.

The Dairy course, in addition to the score-card judging of dairy cattle, will include practice in the best methods of handling and testing, making butter and cheese, and all details of first-class creamery management. Lectures covering feeding and breeding and farm crops for dairy herds will also be given. Dairy husbandry is one of the most profitable lines of agriculture in Tennessee, and the course has been especially planned to start the beginner right in this work.

During this period a complete course in Poultry Management is offered. The university has representatives of all the leading breeds of

poultry and a good equipment of incubators, brooders, houses and yards. This course will be thoroughly practical, and students in the other courses of the period will find the work interesting and beneficial.

A course in Bee Keeping is also offered in this period and may be taken in connection with any of the other courses above mentioned.

The last fortnight of the course is devoted to Fruit Growing and Gardening. Grafting and other forms of propagation are taught, and the student may keep the grafts, cuttings and plants he makes. Pruning and spraying receive especial attention, ample practice being provided in this work. Tillage and fertilizers for fruit and vegetable crops, diseases, weeds and insects are important lessons in the course.

A course will be given in Meteorology consisting of four lectures, illustrated by lantern slides and charts. Two lectures on general meteor-

Short Course Students Judging Hogs

ology give a brief history of the science and its development, and describe the meteorological elements and the instruments used in their observation. One lecture on practical climatology for the farmer outlines observation work that may be profitably carried on by each individual with little or no equipment. One lecture on the work of the U. S. Weather Bureau, and how the farmer may be benefitted by it.

Any one is free to remain during the entire course, and all are urged to do so; but a student may enter for one or more periods as he may elect.

No charge of any kind will be made for the short courses of 1907 by the University. The only expense of the student will be his railroad fare and living expenses. The student is welcome to stay for a single period of two weeks or for the entire term of eight weeks, and every hour of the time will be filled with facts and methods that he can put into practice on the farm when he returns home.

"A profitable husbandry is the very foundation from which all others flow."

PRIZES FOR PROFICIENCY.

Prizes are offered to Short Course students for proficiency in the various agricultural subjects, as follows:

$10.00 in gold, awarded for the best essay on fertilizers with special reference to the value of potash; given by the German Kali Works, New York, N. Y.

$10.00 in gold, awarded for proficiency in agriculture; given by the Virginia-Carolina Chemical Co., Atlanta, Ga.

$10.00 in gold, awarded for proficiency in judging dairy cattle; given by Peter Kern Co., Knoxville, Tenn.

$10.00 in gold, awarded for proficiency in farm crops and farm management; given by Dr. Wm. S. Meyers, New York, N. Y.

$10.00 in gold, awarded for proficiency in judging light horses; given by Hon. E. T. Sanford, Knoxville, Tenn.

$10.00 in gold, awarded for proficiency in breeds and breeding; given by Hon. Wm. S. Shields, Knoxville, Tenn.

$5.00 in gold, awarded for the best essay (not exceeding 500 words) on the handling of poultry for profit; given by the Industrious Hen Co., Knoxville, Tenn.

$10.00 in gold, awarded for proficiency in judging mules; given by Geo. W. Callahan, Knoxville, Tenn.

$10.00 in gold, awarded for proficiency in feeds and feeding; given by J. Allen Smith & Co., Knoxville, Tenn.

$10.00 in gold, awarded for the best essay on Scientific Farming; given by "Agricultural Advertising."

$10.00 in gold, awarded for proficiency in dairy work; given by the Delaval Separator Co., New York, N. Y.

Equipment for an apiary, to the value of $10.00, awarded for the best essay on "The Value of Bees to the Farmer;" given by the A. I. Root Co., Media, Ohio.

The future of Tennessee's agriculture?

Corner of Agricultural Reading Room

EDITORIAL.

Short Courses in Agriculture

The University of Tennessee has offered a short course in practical agriculture every winter during the past five years, and over 150 men have availed themselves of the instruction. They have spent ten weeks, from January to the middle of March, in lecture room, laboratory, barn, feeding lot and orchard, learning better methods of farming and simple lessons of the sciences which underlie all successful agriculture. And they have been benefitted by the experience.

At the State Fair in Nashville prizes were offered the young men of Tennessee for judging live stock and corn. The regular students in agriculture were not permitted to compete, but competition was open to short course students and to young farmers who had not attended the University. In every instance the first and second prizes were awarded our men, and in only one instance did a prize go to a man who had not taken the short course. One of our students took $75 in prizes—more than his ten weeks' residence at the University cost him.

But it is not the money thus earned that is significant; it is the knowledge which the winners acquired while here. The outside men failed because they were not educated in what constitutes merit in the specimens they judged. They did not know as much and they did not know how to use what knowledge they had, and so they were defeated.

The U. T. Farmer wants to see a great attendance at the short course in agriculture for 1907. Men and women of mature years are quite as welcome as the young people. Some of the most interested short course students in years past have been experienced farmers.

The State Fair

The agricultural spirit of Tennessee experienced a great uplift through the State Fair held at Nashville, October 8-13. The good that has come from it, is only the beginning of a great educational influence that is to be felt through the impressions already made and through the lessons to be learned in succeeding fairs. No amount of vivid descriptions or illustrations of pure bred live stock could have produced the inspiring effect that the well fitted animals did in the showing. Men left the State Fair with a higher ideal of what their horses, cattle, sheep, hogs, poultry or farm crop should be, and in many cases with purposes to do what they can to attain that standard. Blooded stock exchanged hands to go into communities where just such types were unknown before.

Though the value of the agricultural exhibits was largely negative, useful lessons were learned from them. The just pride of the Tennessee farmer was stimulated by the occasional excellent exhibits that appeared

among all classes of farm products, and was often replaced by self-reproach when he saw on display, cereals, vegetables or fruit much inferior to the harvest that was then in his own barn, granary and cellar, and which might easily have been represented at the State Fair.

Premiums

The prizes offered by the State Fair commission for the various types and breeds of live stock and for agricultural products, were very liberal. Moreover, they are to be especially commended for the generous premiums offered for county and individual exhibits, for wheat and corn, and for score-card judging of beef cattle and corn. A better understanding of the standard of excellence for live stock and cereals means more intelligent efforts toward attaining that ideal, and the consequent betterment of agricultural conditions.

Races

The races were good and full of interest. They were honest speed contests, most agreeably free from any gambling or betting. Races, in so far as they encourage the development of speed, action and endurance in horses, are good and proper, but whenever they become the medium of gambling they are a curse to any fair.

Data With Exhibits

Occasionally we find an exhibitor at a fair who gives data concerning the soil, cultural conditions, fertilizers, yield, etc., of the crop or crops that he is growing on his farm. This practice is to be highly commended, and it is hoped that such will become common in future fairs. A phenomenally large pumpkin, plate of potatoes, or an extra fine bag of wheat, do not give the spectator much of workable information; but a plate of potatoes with, attached, a brief description of the land on which they were grown, rotation followed, fertilizer used, yield per acre and method of marketing the crop, affords a practical lesson of great value. A plate of perfectly symmetrical, sound and properly colored apples, will do more to excite curiosity concerning methods than a lecture of an hour on thinning, spraying and harvesting the fruit, hence the importance of giving such data with the exhibits.

The East Tennessee Poultry Show

The U. T. Farmer commends to its readers the East Tennessee Poultry show which is to be held in Knoxville December 11 to 15. According to present indications this show will be one of the best of the kind ever held in the South. The number of entries is expected to be large, and owing to the low price of admission, ten cents, and the propitious date on which it is to be held, the exhibition room will doubtless be full of spectators all the time. If you have show birds bring them; if not come and see the prize winners, and confer with your fellow poultrymen about the greatest single farm industry (the poultry industry).

Appreciation

The U. T. Farmer desires to express its appreciation for the congratulations and good wishes that have come to the editor from the many sources. All of these are most helpful and encouraging, and serve to reassure the U. T. Farmer that it has a niche to fill.

Score Card Judging of Sheep, University of Tennessee.

THE STATE FAIR.

Impressions of Members of the Agricultural Club Who Were There.

The Agricultural Club went to the State Fair at Nashville in September, and while it is a little late to discuss it as a matter of news, the reader must remember that the U. T. Farmer was too busy making its bow to the public last month to talk everything, so the fair had to go over to the second issue.

All the club did not go to Nashville, and some of the impressions herein expressed were received by professors, but they are ex-officio members, and their opinions should have at least as much weight as the views of active clubbers. This article is composite—it is written by all of the members who attended the fair; hence the reader may discover a lack of homogeneity in style; indeed he may be impressed with an absence of that rhetorical quality. But the club as an organization holds itself responsible for all that is contained herein, and no one should think of harming the editor because of the manner of presentation.

Professors Morgan, Mooers, Barnes and Price were in the advance guard of University men who attended the fair. They had important and delicate duties as judges in various departments, and they served to the satisfaction of all concerned. Professor Keffer acted as guide, counsellor and friend to Messrs. Neel, Jackson, Fowler, Hicks, Schofner, Henders,

and incidentally advertised the Short Course at the fair. Of the men named it might be said that each developed his own specialty, once he had arrived in Nashville. Jackson must have haunted the Hermitage, because of his name. Hicks developed unsuspected and brilliant abilities as a 'squire of damsels, and in this useful employment he was envied, if not much aided, by Fowler. Neel saw the fair with a thoroughness only equalled by the labors of Henders on the Midway, and Shofner proved the general utility man of the company. Mr. Broome took his camera, and added some splendid plates to the University's large collection of agricultural photographs.

The club rejoiced in the successes of former University men. Hite, of '04, exhibited Southdown sheep and Poland China hogs, and was the proud winner of many prizes.

In the student judging contests Messrs. Broome, Waters, Ogilvie and Roberson demonstrated the value of Short Course instruction, and these gentlemen entered fully into the club spirit, and spent much of their leisure with the members.

The fair was not great in all its departments, though very strong in some lines, and the club gained inspiration that it would like to share with all the farmers of Tennessee.

Horticulture.

In horticulture, had the quality of the exhibits equaled their number the show would have been notable. Making due allowance for the fact of a first exhibition, the display was not of a high standard. The prizes were well placed, on the whole, and the general effect of the fruit was good, but one had only to examine the specimens carefully to see that more than half the fruit shown would have been rejected had the rules of the American Pomological society been enforced. Scab, rot, codling moth and bruises were all too prevalent. The apples were of large size, but the fruit had not been well grown nor carefully handled. The lesson of the display was a negative lesson. The fruit said "don't knock apples off the trees; don't let them be bruised in handling; don't fail to spray with Bordeaux mixture and arsenites!"

The florists of Nashville exhibited very creditable displays of palms and ferns, and the cut flowers, though limited in quantity, were very creditable in quality and arrangement.

The Farm Crop Exhibits at the Fair.

Yes, of course, the season was bad. It was rain, rain, rain. Wheat sprouted in the shock and corn rotted on the stalk. To make a creditable exhibit under such conditions was difficult, especially as "over in ——— county" there had been a fine season, so that the farmers there would have all the advantage. These and other reasons deterred the getting up of displays to such an extent that premiums, all the way from a ribbon

to $500.00, went begging. Giles county made a creditable exhibit, which took the $1,000.00, but it was disappointing and unsatisfactory that there was no competitor. A similar statement could be made in regard to the only collective exhibit by an individual. A number of visitors were mean enough to say that their county could have done better. But if they "could" they didn't, so that silence would have been in good taste.

Exhibits of wheat and corn, however, were not lacking. The first premium wheat was exceptionally fine. The grains were remarkably plump and uniform in size and appeared to be free from weed seeds, etc. The weight per measured bushel was within one-quarter of a pound of the highest. A photograph of 100 average grains of this wheat was obtained and can be used for comparison with first premium wheat in the future. Other data from all the lots was also collected for future reference.

But what attracted visitors the most was the exhibits of corn. There were, of course, numerous lots of dent corn, but flint, pop and sweet varieties were also in evidence. According to the writer's way of looking at the matter there should not be a difference of $50.00 in favor of the first premium for wheat over the first premium for corn. Almost anyone could buy up a few bushels of good wheat, and by careful screening, etc., get up a first class exhibition bushel. On the other hand, the selection of even 10 ears of show corn requires much knowledge and judgment, and is by no means an easy thing to do. Probably the most noticeable defects in the lots of corn were lack of uniformity and of purity. In some instances in the same exhibit there were both large ears and small ears, ears with deep grains and ears with shallow grains, and, worst of all, ears with red cobs along with ears with white cobs, not to mention yellow kernels in white corn, or vice versa. Such corn should not receive any kind of a premium.

The tobacco display was excellent, however, as the writer is not an expert in that line, he leaves it without further comment.

The exhibits of grasses and forage crops were limited, and by no means represented what Tennessee can produce. There was scarcely a sign of cotton, peanuts, and numerous minor crops.

Next time let us hope to see a better average, more competition, and a live interest in the improvement of the farm crops, for so many of which our state is exceptionally well adapted.

The State Fair Association has, by its praiseworthy and substantial efforts, placed every Tennessee farmer under obligation to give his loyal support to the succeeding fairs, so that they may be overwhelming successes.

The Woman's Department.

The exhibition of woman's work, at the State Fair, was under the superintendence of Mrs. Katherine P. Wright, of Nashville.

On the first floor of the "Woman's building," the doorways were hung with curtains of silk pieces woven in various color combinations. These brought forth many appreciative comments from the visitors.

The room on the left of the entrance was devoted to sewing and embroidery. Here were displayed dresses, scarfs, napkins, collars, pillows, and numberless other products of the needle. One long glass case contained elaborate shirt waists. The work was exquisitely executed, testifying to patient skill. Would one dare criticise the artistic value of such elaboration, or question the economy of time thus spent?

In the right hand room were displayed baskets, burnt-wood and leather, painted china and the products of other arts and crafts. Knoxville's exhibit was worthy special mention. The hand work of school girls in one room was exceedingly interesting.

Short Course Domestic Science Kitchen, University of Tennessee.

Upstairs, the food luxuries were exhibited with great attractiveness. It was disappointing to find no "pure food" show, nor any attempt to make this display of educative value to the visitors.

The ladies from some of the most prominent counties held meetings in the tea-room, between the hours of ten and twelve, daily. Their programs were arranged to convey a just conception of the work being done by women in educational and social fields. Though less interesting to the crowd than lace work and jars of jam, these meetings were a truer exhibition of "Woman's work" in Tennessee than the concrete display of sewing and cooking.

However, let this be said, the spirit of co-operation with which the women of Tennessee undertook their share of responsibility, added much toward making the fair the undoubted success it was. No exhibit on the grounds was engineered with more painstaking care nor more appreciated

by the public. And for a first attempt it was exceptionally creditable. The
the public. And for a first attempt it was exceptionally creditable. The
women of Tennessee have given evidence of what they can do, and we predict great things of their future exhibits.

Dairy Exhibits.

The number of exhibits and the great interest taken in the various features of the dairy department at the State Fair show that the farmers of the state are interested in dairying. There was a creditable number of exhibits in each class, and the quality of the butter and other dairy products was good.

Students in the Dairy, University of Tennessee.

The exhibits of dairy products included three classes, namely: Best pound of butter in print; best five or ten pound package of butter in bulk; and the best exhibit of dairy products. There were large exhibits in all these classes and the competition was close.

One of the strongest educational features of the dairy department was the contest between working dairies. In this contest each competitor put in such equipment as he thought best suited for such a dairy, and brought ten gallons of milk from home every day, which was separated, and the cream ripened and churned. There were only four contestants, but the methods and equipment were creditable and competition keen. The best equipped dairy contained a centrifugal separator of one of the standard patterns, a barrel churn, a butter worker, brushes for washing the utensils and a small refrigerator.

The dairies were all well equipped, and the contestants deserve much credit for the way in which they managed their work. This should be made one of the most important features of the dairy department, and there should be ten or fifteen entries next year, instead of four.

A very unique and one of the most interesting features of the fair was the ladies' butter making contest, which was open to the wives, daughters and mothers of Tennessee farmers. There were 13 competitors, who appeared with churns, butter-molds, salt scales, butter workers and white aprons. They were models of cleanliness and went about their work in a way that showed they had made butter before. Their knowledge of scientific butter making was exemplary. The competition was very close, and at no time did this contest fail to draw a large and interested crowd.

If there were more butter makers like these in Tennessee there would be more good butter on the market, and the average price would be raised. The butter made in this contest was of excellent quality, and the ladies are to be highly commended for their effort.

Live Stock.

The State Fair authorities were liberal in their encouragement of the live stock exhibits, and have certainly set themselves right with the farmers who believe that the live stock interests of the state bear a very definite relation to its general agricultural development.

It is not an easy matter to procure such a variety and excellence of live stock as was exhibited the initial year. No type of exhibits requires so much judgment in selection and fitting as animals, whether it be in poultry, hogs, sheep, cattle, or horses, and to begin so auspiciously secures in a great measure the success of the fair in the future.

It is natural to suppose that an exhibit of horses and mules in Tennessee would be in line with the excellent record the state has made for more than half a century. The lighter types of horses predominated, and the conformation and style of the mules clearly indicated the value of the type of mares being used in Tennessee for mule production.

While the general interest centered around trials of speed, it was decidedly encouraging to see the interest manifested in the utility horses and in those specimens which indicated that the laws of selection and breeding had been recognized in their development.

The number of exhibitors of young horses and mules should increase from year to year; otherwise the opportunity the fair offers for greatest production will have only been partially accepted.

Some of the prominent breeders of high class Jersey cattle live in Tennessee, and all were present during the Jersey contests, but not all exhibited their herds. We are sure, however, that this year's contests will bring them all into competition another year. While the ideal milker is pretty well established, there has been a variety of Jersey types used in the development of the herds of the state, and the public has a keen

interest in seeing in competition the best Jerseys Tennessee has selected and produced. We confidently expect a great show of Jerseys another year. Dairy breeds other than Jerseys were rare. Holstein Fresians and Ayrshires from other states were exhibited, and added much to the educational value of the exhibit of dairy breeds. The Ayrshire is a hardy, productive dairy cow, and comparatively new to Tennessee.

Handsome specimens of the beef breeds from within and without the state added much to the interest of the live stock exhibits. Shorthorn, Hereford, Aberdeen Angus, Sussex and Devons were represented and offered exceptional opportunity for study of individuals of the various breeds, as well as for a comparison of all. While the interest centered in the Shorthorns and Herefords, each breed had its followers. Some good points were picked up from the exhibit of beef cattle as to the condition of exhibition animals and the methods of preparing and handling prize winners. Some good animals lost prizes by being illy fitted and out of condition.

The hog and sheep exhibits were excellent, and Tennessee breeders were among the prize winners. Possibly the best animal types of the fair were represented in the hog department. The interest of the public in hogs and sheep was daily indicated by the throng of visitors at the pens. The breeds were well represented. An exhibit of bacon hogs would have added to the educational value of the hog show.

Nothing could have been of more interest than the variety of breeds and the excellence of the individuals in the sheep department. We hope the fair will be the means of inducing a much greater interest in pure-bred sheep in Tennessee, and a study of such crop rotations as will eliminate the stomach and intestinal parasites of sheep, and make sheep breeding and raising profitable upon most of the farms of the state, which seem otherwise admirably adapted for this branch of animal husbandry.

Associated with the live stock of the fair was a beef judging contest open to farmers of Tennessee under 25 years of age. Men who had been regularly classified in any agricultural college were barred from these contests, but we believe the policy of the association will be to open them wide to all in the future.

Animals of various breeds were selected for score-card judging, placing with reasons assigned, and also for testing the competitor's knowledge of the methods of judging. The contestants represented various parts of the state and different types of training. While the score-card method was new to some of the young men, a most excellent record was made and the competition was keen throughout.

Good judges of live stock make excellent selecters and breeders, and the effort on the part of the State Fair Association, to encourage an interest in systematic study of animal conformation and comparison of points as indicated by the score-card, is highly commendable. We hope the field may widen so as to include judging of dairy cattle, horses and mules, sheep and swine, and poultry.

The first fair developed essential points in organization, and with a year's experience and a year in which to prepare for the next, there will be a great exhibit of live stock in 1907.

Poultry.

The display of poultry, says the Industrious Hen, was especially large for a fall fair, as this is a difficult time of the year to get birds in show condition. The poultry exhibition was held in an ideal building for light but as the weather turned slightly cold, it was a little too cold for comfort at night, but a curtain enclosing the side exposed remedied the trouble. There were over one thousand birds on exhibition, and in many classes the competition was very strong. The usually strong Barred

Mr. Orr, Secretary of American Poultry Association, Scoring a Bird Before Short Course Class, 1904.

Rocks held a place further down the line than their White cousins, who led the van both in numbers and strength. White Wyandottes came in for a close second place both in numbers and quality. All the popular breeds were well represented. The fancy and bantam classes were very well filled also. The judging by Judges Marshall and Jones was dispatched under the comparison system and the kicking was slight, less than is usual at a poultry show. The crowds that attended the poultry show were the best of any exhibit on the grounds, a perfect stream of humanity being constantly pouring into and out of the building. This was encouraging to exhibitors and many good sales are reported.

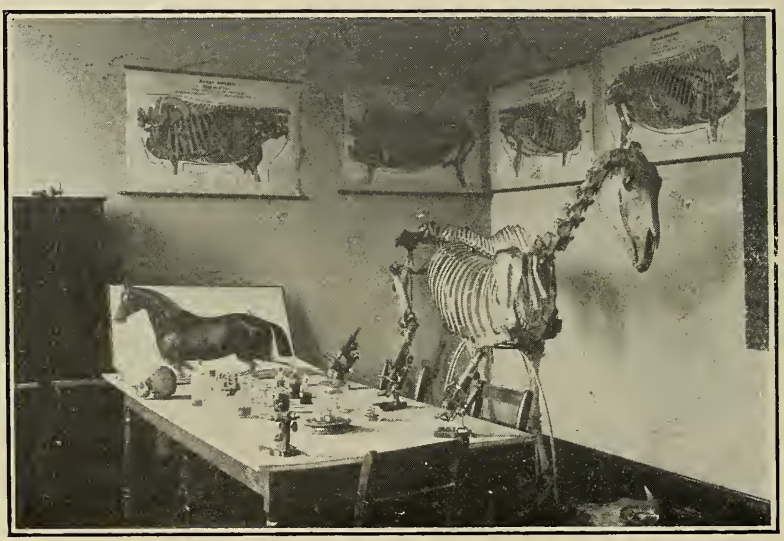
A specially valuable result of the poultry show at the fair, is that a number of the prize winning birds from other states remained in Tennessee. The first White Wyandotte cockerel and pullet, and the first White Rock pullet at the State Fair were bought by Tennessee breeders. The same is true of the first White Rock cockerel of the Indiana Fair, and

of a number of other fine birds which did not score quite as high. The prices paid ranged from $10 to $200 a piece. By such practices as this and by careful breeding and selection, Tennessee may become second to none in the production of first class poultry.

The State Fair is a great agricultural educator.

Machinery.

The space allotted the exhibitors of machinery was well used for displaying their varied goods, in their own tents and to some extent in the open. It was a display complete and thoroughly instructive, for not only did one see the machinery at rest, but also in motion—practically all



Corner of Veterinary Laboratory, University of Tennessee.

from the corn shellers to the large threshers, were being run by some of the small gasoline or large coal engines. Here among this smooth-running, efficient machinery were constantly found deeply interested farmers making careful studies of the fitness of the particular kinds of machines for their definite work. Probably the things among the machinery exhibits that excited most attention were the traction engine climbing a steep incline and the gang plow propelled by an engine.

Plan now for exhibits at the State Fair of 1907.

Other Features.

Lack of space forces the U. T. Farmer barely to mention many things that served to make the State Fair such an eminent success.

Cumberland Park, where the State Fair was held, consists of one hundred and twenty-five acres, and cost the State Fair Association $120,000. It is well suited for displaying exhibits and, moreover, is beautifully located among splendid undulating blue grass farms.

The attendance was good every day of the State Fair, and, at least twice, approximately 30,000 people passed through the gates. There was the best of order; not a single arrest was made, and the gentility that everywhere prevailed was highly complimented by visitors from other states.

The horse shows, in the evenings, were interesting and instructive, and were well attended considering the cold weather.

The mercantile exhibits on the first floor of the Agricultural building, were a credit to the Nashville firms that had goods there.

"Special Days" were full of interest and enjoyment to those concerned.

The musical program consisted of two concerts daily, and was rendered by forty of the best musicians to be found.

Laughing Lane furnished clean shows for the large numbers that sought amusement there.

The air ship, on three days, made successful ascensions and then sailed over the city at the pleasure of the operator. The huge machine controlled so perfectly in its graceful flights excited interested attention.

"Send your sons and daughters to your State Agricultural College; do this even if you have to make some stiff sacrifices. It will pay."

Judging Dairy Cows

INCEPTION OF THE FAIR MOVEMENT.

By R. J. G. Miller in Trotwood's Monthly, October.

THE State Fair is no new idea, although the success of the venture is a matter of much pride to its management and the friends of the movement. The idea of a state fair originated with the Retail Merchants' Association nearly six years ago, although the proposition may have been discussed through the columns of the press prior to that time. The first reference to the launching of such a venture is found in the proceedings of the Retail Merchants' Association shortly after that organization was effected at a meeting on November 13, 1900, during the administration of President H. M. Brennecke; Messrs. J. H. Bruce, W. G. Sadler, John Vaupel, J. W. Johnson and L. Lebeck were appointed a committee to confer with Commissioner of Agriculture Thomas H. Paine on the matter of a State Fair. The minutes of the Association show that:

"Every member of the committee met at the rooms of the association to discuss the State Fair conference, and to outline what was best to be advocated with a show of success. A general interchange of opinion was had, which was felt to be helpful to all gentlemen present."

Later in the minutes of the next monthly meeting of the association the report of the committee follows as Chairman Bruce's report:

"Your committee appointed to attend a meeting at the State Capitol looking to the establishment of a State Fair, would report that Messrs. Johnson, Sadler and Bruce attended the meeting, and while something was said about the fair, there was much more said about the general improvement of the agricultural interests. Since that meeting, another has been held where there was considerable discussion on the subject, and a resolution was adopted looking to the carrying out of ideas expressed at the November meeting and calling on the legislature to enact laws and make an appropriation for premiums or other expenses."

The matter seems to have dropped for a time, and except an occasional card from some one in the newspapers very little reference is found on the State Fair idea until April, 1902, when the matter again came up in the Retail Merchants' Association, the committee having been reconstructed, Joseph Frank being chairman. This time some encouragement to the movement was given by Mr. Thomas J. Felder, who said he would give $1,000 toward defraying the expenses of the fair and would "deliver the goods" as soon as it was ascertained that such a meeting would be held.

The minutes say: "Chairman Frank reported and the report was generally discussed. Mr. Oliver J. Timothy moved that the committee be authorized and instructed to consider ways and means necessary to provide for holding a State Fair this fall (being the fall of 1902). Carried."

Sometime in April, 1902, the Tennessee State Fair Association was organized, and apparently a constitution and by-laws prepared, although the matter seems afterwards to have been temporarily abandoned, but was revived in the same Retail Merchants' Association at a meeting early in the spring of 1905, after which an option was secured on Cumberland Park, the property was later purchased, and the result of the movement is well-known to the world.

In 1902 at a meeting of the promoters of the State Fair, Messrs. J. B. Killebrew, O. J. Timothy, John M. Gaut, James Palmer, J. H. Bruce, T. J. Hindman, H. M. Brennecke, Jos. Frank, W. C. Rayen, A. G. Merritt, Jr., and R. L. Burch were present. Col. Killebrew was called to the chair and R. A. Halley was elected secretary. The charter was read and adopted, thus forming the Tennessee State Fair Association into a separate organization.

The organization for the fair of 1906 was afterwards effected, Joseph Frank being elected president, Nathaniel Baxter and James Palmer vice-presidents, and the other officers whose names appear above. Mr. Russwurm was elected general manager. During the absence of Mr. Frank from the city for some months on account of illness, Mr. Palmer served most acceptably as acting president, giving nearly all his time to the work. Mr. Frank, upon his return, as before his departure, did excellent service. The splendid work of Mr. Russwurm and the active co-operation of the officers showed its excellent results when the gates were thrown open on the morning of October 8.

It is a matter of remark that many of the men who labored for the establishment of a State Fair for Tennessee were "shoulders to the wheel" during its progress and are still in the harness when it comes to the success of the 1907 fair, which is assured, as the lessons learned at the first fair have impressed themselves on the management to such an extent that many new ideas will be worked out in the fairs of years to come.

Short Course Practice Work in Pruning a Mature Orchard.

OVERTON HALL STOCK FARM.

ON Friday afternoon, through the courtesy of Mr. Overton and his manager, Mr. Gentry, the Agricultural Club, Prof. Scovell of Kentucky College of Agriculture, Mr. Butterworth, the advertising manager of The Live Stock Journal, and a few others, enjoyed a visit to the Overton Hall Stock Farm. A ride of a few minutes on the Louisville & Nashville railroad placed our party at its destination, Overton Station. From here a leisurely walk of fifteen minutes through a rich blue grass pasture and finally through the magnificent wooded lawn, placed us at the Hall.

The setting of the Hall is practically above criticism. The vista consists of a grand undulating park, carpeted with rich green grass, and shaded by veteran trees. There the oak, hickory, linden, walnut, tulip, elm and maple trees stand in a degree of perfection of size and symmetry that is sadly too rare. In these trees and on the ground beneath them, gray squirrels hop about in search of food and in their frolics as fearlessly as kittens.

The gentle slope of the land from the residence affords perfect drainage and a commanding position. In the building, itself, convenience, comfort and good taste have all had due consideration, so that the Hall is an ideal country residence. Yet, such good judgment has been used in placing about the building clumps of shrubbery and annuals, and in training vines over the gallery, that it imperceptibly blends with the informal landscape. In the splendid cross hall that occupies a large part of the first floor, there was a big wood fire burning cheerily in the open fireplace. Moreover, the relics of colonial days placed tastefully around, and the works of art and the trophies of the chase that adorn the walls, all add to the richness and completeness of the home.

At one side of the residence and below it, the club got to peep over the box hedge into the formal flower garden. Here the frost had nipped the annuals, but in the green house a fine lot of chrysanthemums were beginning to expand their gorgeous flowers to take the place of their cousins that had made the summer garden bright.

From the intense enjoyment of those things that appeal to the aesthetic phase of life, the club was directed to a consideration of the more practical. The barn for the cows and young stock is complete and almost above criticism. Rooms for grinding and storing feed, silos, milk room, an office where a complete record of what every cow is doing, is kept, the box stalls with cement floors and detachable feed boxes for the calves, the cow stalls with cement floors and with a trolley running just in front for distributing food, all go to make up a thoroughly modern barn. Furthermore, the barns are so arranged that they may be washed out daily with a hose. The washings pass through a drain pipe to a pit, and the solid manure is carried on a trolley to the same place.

The hog barn, in which the animals are fitted for the fairs, is constructed on the same sanitary principle. The floors of the runs, house and the inside walls of the latter, are concrete; so they may be thoroughly washed and disinfected without the accumulation of any dampness, for a spoonful of water will drain out of any part of the building.

The meek eyed Jerseys that were grazing in the park-like pasture, are well worthy of the home that is theirs, though many of the best animals were in the barns on the fair grounds longing for the season to close when they might come back to the luxuries Overton Hall Farm affords them. The expectations awakened by the splendid Berkshires on exhibition in the Overton Hall pens at the fair were fulfilled in the fine specimens of pigs in the pens and of older hogs in the pasture.

Too soon the time came for the club to bid Overton Hall farewell, however, the members will not soon forget the impression that the splendid Tennessee country place left with them.

"Here is the occupation in which the millions of the future may find a happy and contented lot."

FORMER STUDENTS.

'01, Short Course—Mr. C. R. Spangler is engaged in farming on the home place near Madisonville, Tennessee.

'03 and '04, Short Course—Mr. A. O. Ring has resigned the position of manager of a dairy at Asheville, North Carolina, and gone to take charge of his father's farm near Winchester, Tennessee.

'04, Short Course—Mr. Eden Perslinger is successfully conducting a dairy of his own, near Knoxville. He was satisfied to start in a small way and let the business grow with his experience.

'05 and '06, Short Course—Mr. Thomas Broome is engaged in farming at his home near Centerville, Tennessee.

'05, Short Course—Mr. C. E. Holmes is at present working for the Louisville & Nashville railroad, but soon expects to own a plat of ground and begin the employment that he likes best—farming.

'06, Short Course—Mr. Lindsley Waters is engaged in farming at his home near Greenwood, Tennessee.

'06, Short Course—Mr. C. E. Bull is taking the course in pharmacy at the University, but he seems to be more at home in the agricultural building than in Science Hall.

'06, Short Course—Mr. James Tyler is assistant poultryman at the Experiment Station.

Training pays enormously.
It yields big returns in modern agriculture.

PERSONALS AND LOCALS.

Prof. H. A. Morgan and President Ayres attended a meeting of the Association of American Agricultural Colleges and Experiment Stations in Baton Rouge, La. They also attended several other meetings in connection with the association.

Prof. C. A. Keffer is making a tour of the market gardening section of West Tennessee. He will spend the Christmas holidays with his parents in Iowa and will return about January 1.

Prof. C. A. Mooers has just returned from an extended trip in the East. He went especially to attend the meeting of the Association of Official Agricultural Chemists at Washington. He also visited the experiment stations of Connecticut and Rhode Island in order to investigate along the lines in which he is experimenting.

At a meeting of the Farmers' Institute at Harriman, Prof. Morgan, Prof. Keffer and Miss Gilchrist were on the program.

Mr. W. E. Grainger and Mr. G. M. Bentley are anticipating a large hunt for big game in "jungles" of the mountains of East Tennessee.

Miss Kellum has returned from a pleasant trip to her home in San Antonio, Texas.

The Station has tried a new invention in the shape of a pea thresher, by Mr. Koger, of Mooresburg, Tenn. The thresher proves to be a success.

In the Journal of Mycology for September is an article by Profs. Bain and Essary of the Botanical department, entitled, "A New Anthracnose of Alfalfa and Red Clover." This paper gives a short account of this important disease, which has been found to be the chief cause of the failure of the clover crop in Tennessee during recent years. A technical description of the fungus (Colletotrichum trifolii) which causes the disease, is found here, and of especial importance is the announcement that the authors have apparently succeeded in breeding a strain of clover resistant to the disease. A bulletin giving the results of these experiments will shortly appear.

On November 16 the Agricultural club had a good meeting, when Prof. Mooers made an excellent talk on the Outlook for Scientific Agriculture.

The beef cattle for the feeding experiment were bought in Hawkins county, and were sent to the Experiment Station November 15. They are twenty in number, and are very uniform in quality and size, so should give desirable results in the feed lot.

"National prosperity, which means activity and commercial health in all lines, springs from the soil."

"Good times are rooted in the ground. They take hue from agricultural production."

CONTENTS—DECEMBER, 1906

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Contributions from members of the Club and from the Alumni of the Agricultural Department are especially requested.

Advertising rates made known on application. We aim to advertise reliable firms only.

Address all communications to

U. T. FARMER, University of Tennessee, Knoxville, Tenn.

In the Pasture, Part of the Experiment Station Dairy Herd, University of Tennessee

THE U. T. FARMER

Vol. 1. DECEMBER, 1906 No. 3

CO-OPERATIVE EXPERIMENTS WITH FORMER STUDENTS AND ALUMNI.

THE University would like to feel that every agricultural student who has gone out retains a keen interest in the institution and is ready to work with and for her. In other states a plan of co-operative experiments with alumni and former students has been very successful, and no doubt it would be equally satisfactory with us. Indeed, during the past season Professor Mooers has had the valued assistance of a number of ex-students in field tests of fertilizers.

The University of Ohio has developed this work so far that it has become necessary for one professor to devote his entire time to it. He determines the nature and scope of an experiment, supplies the necessary seed, gives minute directions for its complete achievement, and keeps systematic records of the work done. His collaborators in various parts of the state—they now include workers in every county in the state—furnish whatever fertilizers may be necessary, carry on the work according to directions, and report results, with such data of interest as may develop during the season.

The value of such co-operative experiment work to the farmers, generally, may be very great, and to the men who conduct it there must come a very decided benefit. The mere working out of an agricultural problem, whether of crop production, crop protection or soil improvement, if it be carefully planned and accurately conducted, has in it more of educational value than most of the work done in college class rooms. The habit of generalization—of mere guessing—is almost universal among agriculturists. The substitution for it of the habit of accurate methods and consequent experimental knowledge, is a long step toward better agriculture.

Moreover, every neighborhood presents its own problems of crop adaptation and soil manipulation; it would be a great thing for the University and for Tennessee if all who have studied agriculture in the University could unite in working out neighborhood problems of this kind. The faculty will gladly aid in such a movement.

C. A. KEFFER,
Professor of Horticulture.

THE CARE AND FEEDING OF THE CALF.

THE successful rearing of calves is one of the most important problems in farm operations. To raise them by hand requires the greatest care, and to allow them to suck their dams is too expensive. The breeder of pure bred beef cattle, whose purpose is to secure the most rapid growth and development of the calves, whose cows give only enough milk to supply the needs of the offspring, can probably afford to let the calf suck. But the dairyman or farmer who has a few grade cows, can not afford to let his calves suck, when he can secure almost as good gains at less cost by hand feeding. Too many farmers say, "It's too much trouble to feed calves by hand. I just turn 'em in and let 'em suck and then milk what's left." This is not only an expensive way to feed a calf, but it also injures the cow as a milker. Most cows, whose calves are allowed to suck, tend "to dry up" as soon as the latter are weaned.

The greatest advantage of raising calves by hand on skim milk, is that it is much cheaper than letting them suck, or feeding them whole milk. Another advantage is that they learn to eat grain more readily, and will therefore do better at weaning time than calves that have been allowed to suck.

An experiment in calf feeding at the Kansas Experiment Station gave some interesting results on the relative cost of three methods of feeding. The skim milk calves made an average daily gain, per head, of 1.51 pounds at a cost of $2.26 for one hundred pounds of increase. The whole milk calves (those fed by hand but given whole or unskimmed milk), made an average daily gain, per head, of 1.86 pounds at a cost of $5.46 for one hundred pounds increase. Those that sucked their dams gained, daily, per head, 1.77 pounds at a cost of $4.41 for one hundred pounds of increase. Although the gains were better when whole milk was fed and when the calves were allowed to suck, yet the cost of one hundred pounds of gain was $3.20 (nearly two and a half times) greater in one case and $2.15 greater in the other than when the calves were raised by hand on skim milk.

When skim milk is to be fed to the calf it should be taken away from the dam as soon as it has sucked or even before. There is little advantage in allowing the calf to suck before taking it away, unless the udder of the cow is hard, in which case the rubbing of the calf tends to soften it. But if the calk is taken away as soon as it has been "licked dry," it will learn to drink much more readily than a calf that has been allowed to suck a few times. The cow also worries less if the calf has not been allowed to suck. During the first few days it is well to feed the calf three times a day if convenient. However, this is not absolutely necessary, as excellent results can be obtained by feeding only twice a day from the start. Care should be taken not to overfeed. It is a sure cause of scours. More calves are injured by over feeding than by under feeding. At first the calf should receive not more than ten pounds (about five quarts) a

day, giving half in the morning and half at night. If fed three times a day, two quarts should be fed in the morning, one quart at noon and two quarts at night.

This amount can be gradually increased as the calf grows older. Calves will consume from ten to twelve pounds of milk a day when from three to five weeks of age, fourteen to sixteen pounds when seven to eight weeks old and eighteen to twenty pounds when three months old. The above quantities are not to be considered as fixed amount for all calves of the ages given. They are mentioned simply as a guide. There is a difference in the amount of food required by different calves the same as with grown cattle. The feeder must be governed by the size of the calf and by its appetite. A large vigorous calf will require more, while a smaller calf may require less. The feeder must study the calf to feed intelligently.

When the calf is two weeks old skim milk may be introduced into its diet. The change must be made gradually. The feeder may begin by substituting one-half pound (one-half pint) of skim milk for the same amount of whole milk in each feed, increasing the amount of skim milk one-half pound a day until the change is complete. The fat of the milk must next be replaced. This can be done by feeding grain. The best substitutes are corn or kaffir corn meal. If these can not be obtained or are too expensive, wheat bran will give very good results. However, wheat bran is rather high in protein content to feed with skim milk. Calves will begin eating grain when ten days to two weeks old. As soon as the calf is old enough to eat grain, some should be placed in a box where the youngster can get it. If it does not begin to eat readily, a little meal should be placed in its mouth after feeding the milk, and it will soon learn to go to the box and eat. They should have all the grain they will eat up clean, but no more. If any grain is left in the box, it should be cleaned out before feeding again. Calves should have access to plenty of good, pure water. They should have salt. They relish it the same as older animals.

Probably the most serious obstacle in raising calves by hand, is scours. This is the most common ailment among hand fed calves. Scours are caused by a number of conditions, mostly due to careless feeding. The most common causes, and those which can be easily avoided, are over feeding, cold milk, sour milk, dirty buckets and the practice of feeding grain in the milk. Over feeding has been mentioned before. The milk should be weighed or measured accurately at every feed. If it is found that the calf needs more milk, the amount should be increased gradually. Changing suddenly to a heavier feed is almost certain to cause scours. The milk should always be fed warm, and only sweet milk should be used. If it is impossible to have the milk sweet all the time, then it should always be fed sour. Gool calves can be raised on sour milk, but if it is sour one feed and sweet the next, the calves are almost certain to have trouble with scours. The buckets should be washed and scalded after each feeding, so that they will be clean and safe.

The grain should be fed in a box and never with the milk. When the meal is placed in the milk, it is taken directly into the stomach without being chewed, and the result is a case of scours. When a calf shows signs of scours, the milk should be cut down one-half and a tablespoonful of lime water added to each feed. A teaspoonful of dried blood in the milk will strengthen the calf. Usually after two or three feeds, the milk can be gradually increased to the regular amount. If no lime water is at hand, a teaspoonful of baking soda may be used instead.

In short, warm sweet milk fed in clean buckets, a good allowance of corn meal, shelled corn or kaffir corn meal, some bright hay, pure water, salt, plenty of sunlight, good shelter and clean dry stalls with plenty of bedding, should enable one to raise good, thrifty calves on skim milk.

J. N. PRICE, *Dairyman.*

DENATURED ALCOHOL—THE FARMER'S FRIEND.

A GREAT many people have cause to rejoice on account of the passage of a bill in congress, recently, which makes possible the use of alcohol without the payment of internal revenue tax. When this law goes into effect, it will mark an epoch in the history of American agricultural and commercial development. It will be of greater value to agriculturalists than to any other class of working people, because the farmers will be able to make the alcohol at home from the waste products which are raised annually and biennially upon the farm.

This new law which is to go into effect January 1, 1907, provides that domestic alcohol may be withdrawn from bond tax, when rendered unfit for use as a beverage or for medicinal purposes, by being mixed with denaturing materials. Regulations governing all details of the manufacture and sale of this product are to be prescribed by the commissioner of internal revenue.

John W. Yerkes, Commissioner of Internal Revenue, who has spent two months in Europe in studying denaturized alcohol, expresses the belief that the Unitel States will, in time, show the world how to make use of alcohol in the industries. While it is extensively used in France and Germany in some lines of manufacturing, it has not come into general use for generating power.

In the making of alcohol for heat and light, if a quarter of the possibilities in the popular mind are ever realized, this product should be cheap beyond measure. The department of agriculture is saying very little definitely, but is quietly investigating the situation and methods both at home and abroad.

The farmers whose influence secured the law, rightfully demand that it be so enforced as to give them a chance to profit by the new regulation. The American agriculturists do not ask that every little farm be em-

powered to run its own still, but they do demand that the regulations should permit farmers in a district or township to unite in co-operatively owning and operating a plant for the manufacture of denatured alcohol, just as they own and run co-operative creameries. They want the farmers to get full benefit of the proceeds of their crops by converting them into denatured alcohol, instead of being forced to sell such crops at the lowest possible price to distilleries that have a monopoly of the business.

It is said that England and France make their denatured alcohol from grain, while Germany makes about 70 per cent of the same from potatoes. The German government offers special inducement to manufacturers who will use potatoes in the production of this fuel. All the potatoes produced in the empire are graded—one grade for the table, one for food for live stock and the third for conversion into alcohol.

An acre of potatoes will produce over twice as many gallons of alcohol as an acre of corn. James Wilson, secretary of agriculture, before the committee of ways and means, on February 7, last, stated that the average crop grown on an acre of land, will produce or furnish 1960 pounds of fermentable matter; 45 per cent of this will be obtained as absolute alcohol, 882 pounds or 130 gallons. An acre producing 300 bushels of potatoes will yield 3600 pounds of fermentable matter, which will produe 1620 pounds of absolute alcohol or about 225 gallons.

Denatured alcohol is simply the commercial grade of pure alcohol made unfit for use as a beverage or medicine by having wood alcohol or some other material added to it. Alcohol is a product of the decomposition of sugar by the action of ferments, such as yeast. It is made from grapes, potatoes, beets and other root crops, and grains, especially rye, barley, corn and rice. The process depends upon five indispensable factors—sugar, water, a ferment, warmth and air. These must each be present in favorable proportions to produce the most satisfactory results.

In practice, with the simple forms of the still, there is always more or less water and volatile substances, such as essential oils and acetic acid, present in the condensed product, which must be eliminated by other processes. The most common method in vogue, is the continuous redistillation of the resulting liquid until the product is pure.

W. L. FOWLER, '09.

Some of the Buildings at the Experiment Station, University of Tennessee.

MUTTON AND WOOL SHEEP IN TENNESSEE.

THE native sheep found in the mountains of Tennessee are the descendants of the pioneer sheep brought into this state by the early settlers from Virginia and North Carolina. They are strong and healthy, but very wild. Their wool is soft, white, fine and lustrous, and they show a wonderful adaptability for the region in which they live. By using pure bred rams on native ewes, most any of our farmers of average ability could build up a flock better suited to the climate and surroundings than any that could be imported, for these native sheep have inherited their ancestor's healthy and vigorous characteristics. Sheep raisers say the higher the grazing ground the better the wool, and that the carcass increases in size as the grazing ground approaches the level valleys.

Among the first men to begin the improving of sheep in Tennessee was Mr. Crutchfield. His career as a breeder began in 1864 and lasted for over 25 years. The results were as follows: By crossing Spanish Merino rams on native ewes a great improvement was shown in fleece, carcass and contour of body, covering the naked places of the natives with a much more desirable quality of fleece. He also says, that his ewes were very prolific, fifty ewes raising seventy-nine lambs. By the use of the imported Cotswold rams on the native stock he received as good, if not better results.

Middle Tennessee has proven a much better locality for raising sheep of all classes than any other division of the state. There the meadows are fine, the pastures excellent, and the land level or rolling. The first introduction of pure bred sheep into this section was about the year 1813, by Mr. Cockrill, and consisted of seven Merinoes. By careful breeding and selection he developed a type that had no superior for fine wool, either at home or abroad. One fleece that he exhibited won a medal for quality of fiber at the World's Fair in London. But, his flock and nearly all of the other fine wool flocks, finally gave way to the mutton breeds.

The Leicester was the first long wooled breed introduced into this state, and was very popular for many years. Their fleece is not quite as heavy as that of the Cotswold of today, though somewhat finer in texture. The Cotswold sheep are much heavier than the Leicester, and were for a long time favorites because of the larger carcass and greater wool development. When the Southdowns came into the state they soon became the favorites, and to a great extent displaced the Cotswold and Leicester breeds.

In a report published in 1880 Prof. Killebrew said that Southdown, Cotswold and Merino sheep were the three most popular breeds in the state. They and their crosses constituted at that time nine-tenths of the sheep outside of the common natives or scrubs. Since this report was written the Shropshires have grown into favor with many breeders, as well as various other breeds that have been brought into the state. The

writer thinks the Southdown, Shropshire and Cotswold are among the best types for general sheep raising. In Tennessee, as well as in many of the other states, the Southdown is considered almost an ideal mutton breed. The Shropshire is slightly superior to the Southdown for wool, but inferior for mutton. The Cotswold is the best of the long wooled breeds, and it is also a good type for crossing upon the mutton breeds to increase their wool production. Some breeders claim that a cross between either the Shropshire or Southdown, and the Cotswold, produces better mutton than the pure bred Southdown; that this cross seems to retain the best qualities of both parents. From the above, one might say that it is best to cross Southdown and Cotswold sheep for mutton, and Cotswold with Shropshire for wool. This would not be true, for it is maintained by all breeders that the pure bred sheep are the best.

E. F. FULLER, '07.

THE GYPSY MOTH.

Extract from paper by Dr. L. O. Howard, in Year Book of the Department of Agriculture, 1905.

THE gypsy moth is a native of Europe, but was introduced into this country in 1868 by Professor Trouvelot, of Harvard University. Professor Trouvelot was experimenting in cross-breeding this species with the wild silkworms. An egg cluster of the gypsy moth blew out of his window in Malden, and he was unable to recover it.

In 1889 the species had multiplied to such an extent that it was prevalent over an area of 100 square miles, and had become a great nuisance in the city of Malden. The state made an appropriation to exterminate the moth, and was to a great extent successful. However, in 1900 the appropriation ceased, and the unmolested moth began to multiply at an increasel rate. It spread pretty generally over Massachusetts, and appeared in Providence, Rhode Island. Its spread was checked only by private persons who could not cope with a problem that properly deserved the state's most careful attention.

The gypsy moth has only one generation a year. The species is preserved through the winter in the egg state. About the first of May the egg hatches, producing a young caterpillar. The larva (caterpillar) feeds on the leaves of many different plants, but is partial to apple, shade and certain forest trees.

The full grown caterpillar is about three inches in length, is dark gray in color, with two rows of blue spots and then two rows of red spots —five pairs of blue and six pairs of red spots on the back. About July first the larva transforms into a pupa enclosed in a partial cocoon formed of a few threads of silk, sometimes connecting leaves together. The adult winged moth appears from the middle of July to the middle

of August. The male is brownish yellow and is a very active flyer. The female is nearly white, though somewhat spotted with black. The latter is very sluggish, and in fact its body is so heavy that it can not fly.

The eggs are laid in masses of about five hundred each. These masses of eggs are closely packed with hair from the body of the female, and are laid on tree trunks, fences, stone walls and sides of houses.

The best way to combat the moth, is to destroy the eggs, which may be readily found on account of their bright color. However, some eggs will be overlooked or will be out of reach, so the larvae must be dealt with. This may be successfully done by spraying with a solution of the arsenate of lead at the rate of ten pounds to one hundred gallons of water. The above application is not so successful for the older larvae, but they may be trapped in a burlap band tied about the trunk of trees infested by the larvae. This band is to be examined daily and the hidden caterpillars destroyed by crushing.

Fortunately the gypsy moth is preyed upon by a number of parasites and predaceous insects that serve to check its spread. Among these are certain wasps, ants, hornets, beetles, spiders and bugs that feed upon the caterpillars.

W. V. CARPENTER, '09.

TENNESSEE'S NURSERY INTERESTS.

THERE are perhaps few areas in the United States better suited for growing fruit and ornamental trees and plants than certain portions of Tennessee. The increased activity in orchard planting and the growing of fruit in general during the past few years has had a significant effect upon the nursery interests. In this connection it may be of interest to trace the growth of one of the leading industries of the state. Few of us are aware that Tennessee ranks among the first of the nursery states in the Union, yet this is a fact and, furthermore, this industry is annually increasing. Eight fair sized nurseries were added to the list of last year, the present number being two hundred and seven. The larger of these make shipments to all parts of the United States and Canada.

Nursery interests in the state date back to the early '70's when all the nurseries were represented by some half dozen small firms operating in a very limited way. These were chiefly located in Davidson, Franklin, Lincoln and Williamson counties. The stock was chiefly apple and peach, all of which was sold at retail. A nursery in those days comprised but a few thousand trees, and all the work was done by hand in a very primitive manner, paper was used for wrapping grafts, and bark from young linn trees was used for tying in the peach buds. Cultivation was poorly done, with crude implements—the Bragg tree digger being an unheard of machine. In its place the common spade and mattock were used. All seed-

lings were grown at home. The greatest advantage was the absence of insects and fungous diseases in the forms of woolly aphis, San Jose scale, crown gall, and blight, the menaces of modern nurserymen. Nurseries were not required to be inspected annually, neither was a certificate shipping tag necessary for interstate sales. Absolutely no precautions were taken to evade the insect and fungous pests. The pioneer nurserymen of the state were, with rarely an exception, Englishmen, and today many of the leading nurserymen in Tennessee are descendants from these pioneers.

No decided advancement was evidenced in the addition of new nurseries until 1878 and 1879, when several nurseries were organized in Nashville. The largest of these were those of the Newsoms, the Rosebank Nursery, Truett Sons & Morgan. These firms represented the largest retailers in the South. Their business was extensive and profitable, and it was not long before others realized this fact, and nurseries began to spring up in different parts of the state, noticeably at Manchester, Murfreesboro, Winchester, Knoxville, and Loudon. This was a new business for Tennessee and from all appearances a paying one; yet every nursery was small in the sense of a modern nursery, representing as it did but a few thousand trees. Any one of our larger nurseries today grows more than the aggregate of all of the primitive ones put together. Not until the early '90's did the nurseries begin to adopt modern methods and increase materially in size.

In 1892 the Southern Nursery Co., now one of the leading nurseries in the state, was organized at Winchester, Franklin county. This company, of which Congressman N. W. Hale was and is a member, did a flourishing and extensive business, which formed an incentive for others to take up nursery work. Today Winchester and its vicinity have twenty-two nurseries, representing over half of all the acreage in nursery stock grown in the state. Among the other leading nursery counties are Knox, with 25 nurseries, DeKalb with 24, Davidson with 16, Gibson with 18, and Hamilton with 13. Of the 96 counties in the state there are 40 in which nursery stock is grown more or less extensively.

The nursery business in Tennessee is still growing and one is unable to foretell its future. The improvement throughout the country in plant propagation and the increased facilities for distribution have developed trade and competition without as well as within the state. Notwithstanding that Tennessee has 207 nurseries within her borders, there are 76 nurseries from other states which also do a considerable business in Tennessee. The recent interest in planting large commercial orchards has given a new impetus to the growing of fruits, and Tennessee bids fair to become one of the greatest nursery and fruit producing states in the Union.

G. M. BENTLEY.

EDITORIAL.

In view of the fact that Tennessee is primarily an agricultural state and that the total value of the farm crops reaches far into the millions of dollars, it is well to see how the yields per acre compare with those of other states and how nearly they approach those that are being made by individuals within her bounds. Although corn is grown on practically every farm in the state and the total production is very large, the average yield per acre is slightly less than 22 bushels. Some states have an average yield that nearly doubles this amount, and the general average for the entire country is 25.2 bushels to the acre. For wheat, oats, barley and potatoes, in Tennessee, the average yields are respectively, 9.5, 17, 17.3 and 57.7 bushels to the acre; the general averages for the United States are 13.5, 29.6, 25.6 and 84 bushels; and some states in the Union make the splendid yields of 26, 41.5, 30.4 and 48.5 bushels.

It might be said that Tennessee is not as well adapted for growing these crops as many other sections of the country, if excellent yields of all of them were not produced in all parts of the state. Many farmers in Tennessee make an average of 20 bushels or more, of wheat to the acre, and some as much as 30 or 40 bushels. The same may be said of corn, oats, barley and potatoes. Crops are produced by individuals, that are four or five times as large as the average yields for the state. Three hundred and fifty bushels of potatoes and forty bushels of wheat per acre, have been and are being produced on the Barrens of Tennessee.

These comparisons do not by any means show that the methods used by Tennessee farmers are wholly at fault, and such is not the case, but they do show that the agricultural production of the state might easily be doubled without using any more land than is under cultivation at present. To double the yield per acre would not only double the income, but also increase the percent of profit. Two bushels of wheat would be grown where one formerly grew, and at a decreasing cost of production, for no more land would be required, very little, if any, more seed and not twice the amount of cultivation and labor of harvesting.

In recent years much has been said in regard to the preservation of our forests, especially on the steeper lands, and some definite steps have been taken in the right direction. Yet more education on the subject, is necessary before American citizenship will give it the consideration that it deserves.

Many of the steep mountain regions of the eastern part of the country are, while covered with forest, places of magnificent beauty, sources of clear, cold and pure streams of water and, under proper management, sources of a constant supply of mature timber. But when these steep lands are cleared most of the beauty is destroyed, many of the streams "dried up," others reduced in size and purity, and the soil soon badly

washed. Such examples of land that has been made almost worthless and an eyesore by clearing for cultivation, are already entirely too numerous in this country. To see what the ultimate result will be if preservative measures are not adopted, it is necessary to go to an older civilization. In the Alps of France the clearing of the land for agricultural purposes, was followed by such serious washing of the steep lands by floods after heavy rainfall and by the "drying up" of many streams in the summer, that the government, at a cost of over $35,000,000, built a system of dams to control the torrents and have begun the slow process of reforesting the devastated area. In America the question is largely one of protection, for the process of complete destruction has not gone so very far yet, but reconstruction of deforested areas will be necessary if preservative methods are not adopted at once.

However, not only does the complete clearing of the land do great injury to the forest, but also the ruthless lumbering, followed by fires and grazing of sheep and cattle, has about the same effect. A system of lumbering that has no other thought than of immediate profits, wreaks havoc with seedlings and immature trees, and leaves the forest in a favorable condition for disastrous fires. Then, when is added the destructive effect of the grazing animals by eating and tramping seedlings and so cutting the soil with their sharp hoofs that serious washing often follows, the killing of seedlings by the direct rays of the sun and by choking with rank growth of weeds that follows clearing, the lumbered area has a poor chance to reproduce itself.

The mechanical perfection of lumbering in this country is unsurpassed, but in regard to forest growth and protection the methods are as primitive as those of the savages that formerly girdled the trees and planted their corn crops on the hills and in the valleys of America. The inimical genius of the inventor and schemer has perfected the methods of taking the timber from the woods and manufacturing it into the finished product, but has sadly neglected planning for the perpetuation of the lumbering industry. Only when reproduction of the useful species balances or exceeds the consumption of the same, will forestry have assumed the proper place in America.

RESOLUTIONS.

Resolutions in favor of appropriation for University and Public Schools adopted by the students.

On December 6, in a mass meeting, the students of the University of Tennessee adopted the following resolutions:

The most important interest in the state of Tennessee today is the improvement of the schools for the education of the children. To this end more money is needed for the elementary, secondary and high schools, for normal schools and for higher education. We, therefore, the students of the University of Tennessee, do hereby petition the General Assembly at its next session to make the following appropriations and we request all members of the General Assembly from the districts which we represent to give their support and influence to the enactment of laws providing for such appropriations:

1. An appropriation of such an amount as will give not less than 75 cents per capita to each child of school age in the state, in addition to the amount arising from interest on the state school fund.

2. The continuation of the appropriation of $50,000 a year to help weak schools as provided by a law enacted at the last session of the General Assembly, and known as the Tollett bill.

3. An annual appropriation of $25,000 to encourage and assist the establishment of public high schools.

4. An annual appropriation of $75,000 for the establishment and maintenance of three normal schools for the education and professional training of teachers.

5. An annual appropriation of $50,000 to the University of Tennessee.

6. An annual appropriation of $5,000 to encourage and assist rural schools to establish school libraries.

(Signed) R. W. PAFFORD, Chairman.
JOHN W. SPENCE, Secretary.

Similar resolutions have been adopted all over the state, and the sentiment of the people is undoubtedly for the proper support of the public educational system from the primary schools to the University.

THE OBJECTIONS TO DRAFT HORSES IN TENNESSEE.

TENNESSEE now stands next to Kentucky in the production of fancy mules, saddle and harness horses, and Kentucky stands first in the Union. Why is this? It is because the majority of our horses are closely related to the Thoroughbred and the Standardbred horses. The reason Tennessee's mules are so much in demand today, is because they are from these highly bred mares, and therefore are of a great deal finer type than the northern and western mules, which are from draft

mares. The Tennessee mares have finer hair, more style, better action, and are smoother in conformation than the draft mares, and hence their mules naturally excel those foaled by the draft breeds in all these respects.

If draft horses were brought into this state, the result would be that they would be crossed with our native horses, and thus lower the speed of the harness horses, ruin the gaits of the saddle horses, besides giving us a coarser class of mules.

With the majority of the farmers the terms draft and coach horses are misunderstood. The draft horses are as follows: Percheron, Belgian, Shire, Clydesdale and Suffolk Punch; while the coach horses are chiefly represented by the French, German and English Coach Horses and the Hackneys. The standard draft horses are from $16\frac{1}{2}$ to $17\frac{1}{2}$ hands high. The mares should weigh from 1,600 to 2,000 pounds, and the males from 1,600 to 2,200 pounds. The coach horse should be from $15\frac{3}{4}$ to $16\frac{1}{2}$ hands high and weigh from 1,200 to 1,500 pounds.

The cross of the coach horse and our native mares is a very good all purpose animal, because he has good style and action, and has sufficient size for most work. The Hackney bred to native mares, usually results in a good cross for the production of mules. The sire gives the mule good weight, which is important, for the general tendency is to breed for fancy points and to neglect the size. It is true enough that the draft mare gives the mule plenty of weight, but at the same time she makes them coarser than is desirable.

As for draft horses on Tennessee farms, they can not be used to much advantage. They are not nearly so well adapted to our climate and conditions as are the lighter breeds of horses and mules, and if bred here the points in them that are most desirable can not be maintained. A pair of mules $15\frac{1}{2}$ hands high can do more work in the summer than a pair of horses $16\frac{1}{2}$ hands high, and live off half the amount of grain feed. Another serious objection is that horses must have one driver all the time or they are likely not to be true long. On the other hand a mule does not care so much about who is driving him, and this is important for the farmers of the South, who often do not have regular drivers.

It seems that the best thing that the horse breeders of Tennessee could do would be to improve their native animals by careful selection in breeding, and thus have still finer horses to go on the market rather than "chunks," which would be the result if draft breeds were imported. By this careful selection in breeding, weight, style, action and form may be combined in our horses, which would be very much better than to forfeit style, action and form for weight by substituting draft breeds.

CLAUDE HIX.

A LETTER TO THE U. T. FARMER ON SHEEP HUSBANDRY.

ACCORDING to its area, Tennessee has as much territory adapted to the rearing and growing of sheep, as any of the Eastern states. The soil, altitude and climate are all good enough. No longer are there any wild animals in the woods or mountains and no fowls in the air to give the sheep grower any trouble.

The only four-footed animals that remain to trouble the sheep in Tennessee, are the mule and the dog. The mule may be kept in the stable or at a proper distance from the flock when the little lambs "are coming." The dog is a faithful animal and seldom kills sheep when properly fed and well treated. From August to April the dog seldom ever attacks sheep. The time of the greatest danger, is just after clipping. The changed appearance of the sheared sheep and the half starved condition of the dog, combine to make this period a critical one for the flocks. The dog is not so much to blame, for, at that time of the year when food is scarcest, often he must "hustle" for himself, steal his living.

What we need is a law requiring every man in the state, who owns a dog to give a bond for one thousand dollars, to the county and state. This bond should be kept at the county court clerk's office. All dogs for which bonds had been given, should wear collars to indicate the fact and to show that the owners are responsible for whatever damage the dogs might do. Dogs not "bonded" would be considered as nuisances by the law, and it would be legal for any one to kill them when off the premises of the owner.

Now, think of this, the state of Tennessee has only one and a half sheep to the farm, and two dogs to the same area. There is something wrong.

The growing of fat lambs for the spring market, is certainly a profitable business, as some of us can testify from experience. It brings the farmer an annual income, and the capital is retained from year to year. The same can not be said of other farm animals—hogs excepted, and they are not so easily marketed for cash. There is hardly a farm so small or so poor that a few ewes can not be kept on it.

The way "to go about" building up the sheep industry of a county is for some of the leading farmers to call a meeting, stating the purpose. Each civil district should be well represented in the meeting, and an organization for the importation of sheep be formed. By this method of co-operation a number of ewes and thoroughbred bucks may be secured without heavy expense to any individual. The bucks should be unrelated so that the farmers may exchange males without having to resort to in-breeding, and a few thoroughbred ewes should be bought. The way we did in Johnson county was as follows: We commenced with from ten to twenty-five ewes, and sometimes more, apiece. On these ewes we used thoroughbred bucks. We sold all male lambs and kept the ewes, and at the end of two years exchanged bucks with our neighbors to avoid in-breeding.

Speaking from experience, I would say that the Shropshire is the best breed. They will give you a good coat of wool, and the ewes have very large udders that afford an abundant flow of rich milk. They deliver the lambs without any trouble, and nearly always give birth to twins which, if properly fed, will be up to the standard at marketing time.

When the co-operative plan of sheep growing is once established, the dogs give but little trouble. Buyers will come into the community and take your lambs at a good price, and will contract for those of the succeeding year (yet unborn), they are so anxious to handle them. Never has there been a time in the history of the state when sheep paid as well as they do now.

But little experience is absolutely necessary for the beginner. However, there are some fundamental lessons which, if not learned from books, agricultural papers, or some experienced shepherd, will cost very dearly. I have been in the business of raising sheep for twenty-four years, and at some future time will write another letter for the U. T. Farmer, telling "How I Do It."

N. R. WILLS.

TURKEY RAISING.

SINCE it has been learned that, to a large extent, the fatality in young turkeys is due to inbreeding, turkey raising has taken on a new life. The effort to introduce, throughout the country, the several standard varieties of turkeys, has supplied rich, new, vigorous blood to all sections. Strength and vigor have been added to innumerable flocks, and thereby, to some extent, the stock that had become deteriorated through the carelessness and inattention of the producers themselves, has been "built up."

There is no other kind of live stock that can be grown so cheaply as turkeys, since from the time they are three weeks old until winter "sets in" they live almost entirely off of insects and grass which they gather on the range, and since they bring, on the market, from ten to fifteen cents per pound. In addition to being, in a large measure, self sustaining, they are of great value to farmers as insect exterminators, for each turkey destroys hundreds of them daily. Perhaps the most important factor in turkey raising is securing large, vigorous, unrelated breeding stock. One should not strive to have them unnaturally large or too small, but of medium size, if best results are expected. Over large turkeys will trample their young and will not lay as many eggs as those of medium weight. The small ones, as a rule, will produce undersized offspring that will eat almost as much as those of medium size, but will never grow to be as large.

It will cost a little more to secure good stock, but they will more than pay the difference in one season. Each person has his choice as to the variety he will raise, but the Bronze is the general favorite, as they are

larger and more vigorous than the other varieties. Now is a good time to secure breeding stock, that they may feel at home by laying time next year.

In mating turkeys it is not best to have over six hens with one tom. Old hens should be selected, if possible, but a tom that is over eighteen months old should not be used, as the eggs are likely to be infertile if he is older.

The hens will usually begin to lay sometime during March or the first of April. Here a question arises as to whether they shall be allowed to make their nests where they please over the place, or be penned. We have found penning the most satisfactory. A six foot poultry fence is stretched around, say, an eighth of an acre of ground and the birds are placed there two or three weeks before laying time, that they may become accustomed to confinement. They are then kept in this enclosure until all begin to lay. They may be turned out late in the afternoon to graze and secure a fresh supply of grit, and then tolled or driven back, if they do not return of their own free will. In this pen barrels are turned down and brush are piled over them after making a good nest inside. If one is gentle with the birds they may be turned out after all are laying and they will go back to lay in their nests in the barrels. The hens lay from fifteen to thirty eggs before becoming broody, and may then be "broken up," and will lay another clutch.

When the hens begin to set, about eighteen eggs are placed under each one, if turkey hens are to be used. We have always found it better to use chicken hens to hatch the poults, for they do not break as many eggs as the turkeys. The turkey hen will always accept the poults, and should be given from twenty to thirty.

Now comes the critical time in the life of the turkey. Lice, dampness and indigestion all seem to combine against the little fellow. The lice can be destroyed by dusting the hen several times with a good insect powder, while she is setting, and rubbing a little grease on the top of the heads and under the wings of the poults as they are taken from the nest. As they are likely to wander from the hen for the first few days we keep them in a pen made of boards about a foot wide, placed down edgeways. This pen should be on sloping ground that the water may run off readily after a shower. Fresh water and fine sand should always be kept before them. For the first few days we feel stale bread soaked in milk, or dry bread with cooked eggs four or five times a day. As they grow larger we substitute cracked grain and then whole grain.

After they are allowed to roam at pleasure it will be necessary to drive them home at night for a while, but if treated kindly and fed every evening when they are "driven up," they will soon return of their own accord.

As winter approaches it will be necessary to feed them about all the corn they will eat, if nice plump turkeys are expected. The producer has his choice of placing them on the Thanksgiving or the Christmas market.

They should weigh from fifteen to twenty pounds at Thanksgiving and from eighteen to thirty pounds at Christmas, if properly fed.

There is, in the raising of turkeys, a great opportunity for the Southern farmer. The climate is good, in fact they grew here, most abundantly, in their wild state. All that is necessary is a little time and patience, and good results are assured.

W. M. LANDESS.

THE EAST TENNESSEE POULTRY SHOW.

THE poultry show held at Knoxville, December 11-14, was a great success. This is the second show of the East Tennessee Poultry Association, and great improvement and an increased interest in the institution is manifest.

About 1,200 birds were entered, and the Barred Plymouth Rocks exceeded any other breed in numbers. The keenest competition was among the Brown Leghorns. A hen of this breed, owned by J. H. Henderson, Knoxville, scored 95½, which was the highest score made by any of the birds not "handicapped."

The Association gave a banquet in honor of visiting poultrymen, on the evening of December 13. The occasion was thoroughly enjoyable to all present, and its influence in more completely harmonizing the efforts and aims of poultrymen, should be most helpful.

J. H. Henderson, Knoxville, was elected president of the Association, and J. T. Oates, secretary and treasurer, for the succeeding year.

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JAPANESE PERSIMMONS.

IT may be gratifying for the people of Tennessee to learn that the best varieties of Japanese persimmons can be grown in this state. Mr. T. C. Schnicke of Riverdale, and Mr. W. C. Jones of Athens, are two successful growers. They both report good yields from trees not more than six years old from the graft.

HIYAKUME PERSIMMON.
Natural Size.

The trees of the Japanese Persimmon are of medium size when grown on their own roots and in their native habitat. It is very probable, though, that they will attain a much larger size in this country when worked on roots of the native persimmon.

The flower is about the size of a twenty-five cent piece and of a whitish green color.

The fruit ranges in color from a light yellow through the various shades of red and yellow, to a dark red. The fruit is not commonly so large in Tennessee as in Florida, but Mr. Schnicke has grown many specimens weighing fourteen and one-half ounces.

There is a general impression that frost is required to ripen the Japanese Persimmon as well as the native species. This is erroneous, as nearly all of the Japanese Persimmons are ripened without frost. Most of the trees are grown in sections where frost does not occur until after the fruit is fully matured. In Tennessee the fruit is gathered about the first of November.

The varieties that have been fruited in Tennessee are Hachiya, Hiyakume, Tsuru and Kali. The fruit is generally used in the fresh state. Many housewives have tried preserving the fruit but the attempts have proven unsuccessful.

The Japanese Persimmon can be readily propagated from the seeds, but this method can not be used when it is desired to reproduce the characteristics of the fruit from which the seed has been taken, hence seeds are used only for the creation of new varieties. Budding is sometimes employed, but this method has not been so successful as grafting. The cleft and splice forms of grafting have been most satisfactory. A union of the scion and stock is most certain when the operation is performed in early spring before the buds have swollen to any considerable extent. The stock may be any size from three-eighths of an inch to two inches in diameter. Mr. Schnicke's orchard was made by grafting wild seedlings where they happened to be growing in his fields.

In Tennessee the Japanese Persimmon needs a light and thoroughly drained soil. It will do fairly well on poor land, but succeeds much better in rich soil. In this climate where the growing season is much shorter than in the other Southern States in which the persimmon is most extensively grown, it will probably pay to use commercial fertilizers, especially in the form of potash and phosphoric acid. Judging from the heavy foliage of trees grown in naturally poor land, we should conclude that the use of nitrogen is rarely, if ever, necessary. It is believed that too much nitrogen is one cause of the fruit dropping prematurely.

The majority of growers in the Southern States recommend thorough cultivation during the summer season, contending that the persimmon responds to this kind of treatment as well as any other fruit.

Persimmon trees are more difficult to transplant than other orchard fruits on account of the long tap roots. In digging young trees care must be exercised not to cut off too much of the tap root, for this is quite certain to result in the death of the tree. It is safest to use trees not more than one or two years old, whose tap roots are short. If the trees have been grown in this climate and are well hardened, fall planting will give the best results. But if trees are received from a more Southern nursery it will be safer to get them in the spring and plant as soon as possible after their arrival. Twenty-five or thirty feet between the trees is a good distance for planting.

The trees do not require much pruning. It is simply necessary to remove dead limbs and those that interfere with the growth of others, and to cut back the leading branches so that a symmetrical head is formed.

Thinning is an essential operation when a considerable quantity of the fruit does not drop prematurely. The Japanese Persimmon is exceedingly productive and thinning is important for the following reasons: First, to secure larger and finer fruit; second, to promote longevity; third, to secure annual crops of uniform proportions. Thinning should be deferred until the fruit is at least one inch in diameter. Removing the surplus specimens at this time will not result in overthinning as premature dropping generally occurs before the fruit has attained the size mentioned. Thinning is especially important for very young trees.

In this latitude probably most of the Japanese persimmons will ripen before the advent of frost. As the keeping quality is injured by frost it is important to pick the fruit before its occurrence. Care should be exercised not to bruise the specimens in handling. After harvesting, the fruit should be stored in a cool, well ventilated, moderately moist place where they will ripen gradually.

Persimmons should never be marketed until fully ripe, for if the consumer secures an unripe specimen with considerable astringency, it is not likely that he will make another purchase unless he understands the real merits of the fruit. When the grower becomes familiar with the fruit of the varieties which he cultivates, he should experience no difficulty in ascertaining when each specimen is ready to market without sampling it.

Japanese persimmons are sold in Southern cities, in local markets where they are grown and in a few Northern cities. The growers realize from $1.50 to $2.50 per bushel. The best specimens sell in New York at 50 to 80 cents per dozen. Florida and local specimens sell upon the Knoxville market at 25 to 40 cents per dozen.

While the trees have been badly injured in severe winters—the fruiting wood was all killed on Mr. Schnicke's trees two years ago—it is believed this delicious fruit is worthy of extended trial throughout the state, and particularly in West Tennessee where the winters are less severe than in the eastern section.

ALBERT T. ANDERS.

THE RASPBERRY.

THE raspberry, like the strawberry, is well connected in that it belongs to the Rose family. The Greeks traced the raspberry to Mount Ida, hence its original name, Rubus Idaeus. The derivation of our English name for the raspberry is interesting, being from the German Kratsberre, Scratchberry, which name in the earlier native varieties is appropriate and significant.

The Elder Pliny, who wrote not far from A. D., 45, states that the raspberry is a true bramble and also traces it to Mount Ida.

Mr. A. S. Fuller, one of the best read authorities upon horticultural topics, says that Paladius, a Roman Agriculturist, who flourished in the Fourth Century, mentions the raspberry as one of the cultivated fruits of his time. It was promoted to the garden long before the strawberry was thus honored. The flowers are very unobtrusive and as a honey plant it is unsurpassed.

The raspberry is not a native of our Southern States. We, of the Southland, find that the raspberry needs protection from our Southern summer suns and long continued drouths, hence plantations on Northern or Eastern slopes and on naturally moist, but well drained land, do best.

During the first year after planting, the ground between the rows should be frequently and thoroughly cultivated so as to maintain the "dust mulch" that is now being so successfully practiced in the arid regions of the "Great American Desert." In my own fields, I have successfully conserved the moisture, after the first year, by heavily mulching the ground between the rows, with forest leaves, which with me are most available. There can be no better mulch for Southern fields than a covering of pine needles. A mulch not only perfectly conserves the moisture and prevents fall fruiting and the consequent death of the year's growth, but it also keeps the ground cool and the pickers clean, and above all, the berries which frequently lie flat upon the carpet of leaves are also kept clean and sweet. A mulch also enables the pickers to get into the field soon after a rain without miring in the mud and by constant puddling turn the field into a condition somewhat similar to the ground in a brick yard. The mulch also aids in keeping down the weeds and suckers (the last being more destructive to productiveness than the former). The mulch also renders cultivation entirely unnecessary and furnishes a favorite fertilizer free from the weeds in barnyard manure.

The raspberry thrives on almost any kind of well drained soil and exposure. I have a field which has a southwest (the very worst) exposure, on an old worn out hill that has been in cultivation for nearly a hundred years; every particle of humus has long ago been washed away. A liberal coating of stable manure and forest leaves applied as a mulch, after the plants were set out, have wrought wonders on this old barren hill. I submit herewith a picture of this field of a little more than an acre, showing its condition the second season after planting.

From the acre of land shown as frontispiece, the third year after planting, I netted for plants and berries $509.32.

Rev. E. P. Roe, in his "Success with Small Fruits," claims that the raspberry will continue to bear profitable crops for fifteen years, but in our locality, near Chattanooga, Tenn., it does not pay to leave the raspberry field in bearing for more than ten years.

There are three leading sorts of raspberries: The reds, the blacks and the purples; the blacks and purples are known as caps and propagate from

the tips of the canes growing into the ground, and are familiarly known as "tips." The reds are propagated by root cuttings or suckers. It is the opinion or to the profit of many to contend that the root cutting plant is worth much more than the sucker, but Mr. Roe says, "If the sucker plant is taken with fibrous roots, I should regard it as equally good."

As to varieties, their name and number is legion, and the new and untried sorts are numerous, chiefly valuable, no doubt, to the man who sells the plants at fancy prices. I am tempted to quote pages 204 and 205 of Rev. Roe's experience with new varieties, but will content myself with a simple reference to the book and page, and suggest that any one wanting to engage in small fruit culture, could not invest a dollar to a better advantage than in this most interesting of all of this great author's many productions.

I have tried many varieties that started out so well and made such promises during the first season, that I thought that I had an acquisition, but time has developed weaknesses that were fatal, and my anticipations have "gone glimmering," until I can number the varieties that I would plant upon the fingers of one hand.

As to trimming, I never cut back or pinch back after the middle of June, as late trimming produces a late and a tender growth that is sure to be killed during the coming winter. I cut back severely, after the first year, one-half or more of the year's growth, at any time during the winter, and leave the trimmings upon the ground between the rows, which with the growing canes keeps the mulching from blowing away. As to the red varieties they sucker so badly that I have almost abandoned their culture. It is far more satisfactory and profitable to grow only such varieties as propagate from the tips.

As to varieties, there is none better than the Old Cuthbert, among the reds. This chance seedling found growing in a bed of Red Antwerps in the grounds of Thos. Cuthbert, over 50 years ago, has never been surpassed as an all round serviceable and reliable variety. It resists both winter's cold and summer's heat, and produces abundantly. Another red of value is the King, a hardy and productive sort that is ten days earlier than the Cuthbert.

Among the black caps, the Ohio, or Miami, stands as an unequaled sort for earliness and productiveness and hardiness. It is of medium size and of fine flavor and bears shipping well. I have grown it for fourteen years, and it has never failed me. It has always more than paid expenses. I call it my "money maker."

Shaffer's Colossal and the Cardinal are two worthy purple sorts that will pay well for the attention given them. The Shaffer's Colossal is inclined to die back, but up to the present time the Cardinal, with which I was not well impressed at first, has proven entirely hardy.

There are several sorts, that with me, after fourteen years, I do not consider worth ground room. Among the caps that I have discarded and consider practically worthless in this climate are the Gregg, Eureka,

Mammoth Cluster, Palmer, Munger, Cumberland and Columbian. With me the Loudon, Miller, Turner or Southern Thornless and the beautiful Golden Queen are the red and yellow sorts that I have abandoned in this climate.

There is no more profitable crop grown than the raspberry, and there is no more delicious fruit than this first choice from the "Garden of the Gods."

I can not enter into further details in an article of this character, but to any one sending me an inquiry, I will send, a treatise on the Raspberry that will give all needed advice.

L. B. SEARLE.

East Chattanooga, Tenn.

The book "Success with Small Fruits," by E. P. Roe, mentioned in the above article, is a work of recognized merit and can be safely recommended to the readers.

THE PEACH BORER (SANNINOIDEA EXITIOSA).

OF all the enemies that infest the peach, the borer is the worst. The insect is indigenous to America and has been a parasite on the peach for over two hundred years. The borer first became a pest in New York state, and from that region it has become widely distributed over almost the entire country. At present it has to be fought by every successful peach grower, and the damage that it inflicts renders it a grave factor that must be reckoned with by every orchardist.

The adult form is a moth; the male and female can be easily distinguished. The female is dark navy blue, the fore wings being the same color, while the hind wings are transparent. A broad orange band covers the fourth segment of the abdomen. The female moth is much larger than the male, its body being about one inch long and having about one and a half inches wing spread. The male, besides being much smaller than the female, is more slender, and more variable in size. The ground color is blue and each segment is separated by a yellow ring, also it has the characteristic yellow collar.

The egg is oval in shape, dark brown in color, and is richly sculptured.

The larva is a whitish or a creamy yellow grub. It is very small when hatched, being about one-twelfth of an inch in length, but it begins feeding and increases in size very rapidly until it reaches one to one and a fourth inches in length, in the largest specimens. The larva has three pairs of "true legs," terminating in dark brown claws, and five pairs of

"false" or "pro(p) legs." The head is dark brown with powerful mandibles for biting, and the body of the larva is sparsely covered with bristles or hairs.

The pupa is enveloped within a cocoon that is a long, rough-looking case or capsule from three-fourths of an inch to one inch in length and about one-fourth of an inch in diameter, dark brown in color and made of minute particles of bark and voidings of the larva cemented with peach gum. The inner walls of the capsule is lined with a soft, silk-like fabric. By removing the cocoon, the sex of the moth can be distinguished, on account of the wide yellow band that can be seen through the translucent pupa case on the abdomen of the females.

The larva after feeding ravenously in the burrows in the tree trunks during the late summer and fall, hibernate for a short period of time if the winter is severe, but it is doubtful whether they cease eating during the mild winters of this section. Larvae of all sizes and in all stages of development can be found in the orchard after the deposition of eggs has begun. In the spring those that were hatched in the late summer will be quite large. There will be a limited number of small ones that were hatched in the late fall. But the major part will be medium in size, representing the main hatching that came out in September. Other investigators have observed that a small per cent of the larvae will emerge and pupate in the spring or very early summer, but the greatest per cent leave the burrows in the tree trunks and pupate during the month of August. In old trees that had large lateral roots, larvae were found seven feet from the trunk of the tree. The fact that the burrows were continuous from the tree trunk to the point where the larvae were located, shows that they entered at the base of the tree and bored out to the distil end of the roots.

The cocoons which have already been described are generally located in the mass of gum that is always present, or just beneath the surface of the ground, close to the trunk of the tree, or if the gum and earth have been scraped away the larvae will pupate within the mouth of the burrow. The larvae after lying dormant for three or four days within the cocoon, transform into the chrysalis state and remain in this form from three weeks to one month. The average period of pupation being from 25 to 27 days.

The adult moths begin to appear in the station orchard between August 20th and 25th and reach the maximum about September 1st. A straggler appears now and then until frost, but they form a very small per cent of the total number of moths.

Mating begins as soon as the adult's wings are dry and are strong enough to be used. Ovipositing at once follows. The prolific female deposits her eggs at the rate of about sixty per day, either singly or in clusters, lightly attaching them to the bark of the tree from the surface of the ground up to the height of one foot to eighteen inches. But if ovipositing is prevented by any repugnant substance or wrapping paper at this

point, the female will go up a little higher on the trunk and even out on the lateral branches to deposit her eggs. This fact is a good point to remember. Its importance can not be emphasized too much, since it proves that all efforts to prevent deposition of eggs are useless. The ignorance of the fact has cost many hard earned dollars and much time and tedious labor. Each female will lay 400 to 600 eggs.

The adult life of both sexes is very short, but the males do not live quite so long as the females. They live from five to ten days, with an average of a week.

More than ten months of the year is spent by the borer in the larva form (the feeding form), within the burrows in the tree trunk, about one month in the pupal stage, and leaving about two or three weeks to be covered by the adult and egg periods.

The egg hatches in from six to nine days into a minute caterpillar. Immediately, if no obstruction is met with, the larva will crawl into a crack or injured place on the tree and begin to burrow, drilling passages under the bark. Their presence is always very evident on account of the copious exudation of gum mixed with chippings and voidings. This completes the life cycle of the borer.

The orchardist has been fighting the borer for a century and every practical remedy has proven a failure. From actual observations, many of the time honored remedies are ineffectual in controlling the pest.

Spring "worming" is recognized as an established way of getting rid of the borers, by bodily digging the larvae out of the trees with a sharp knife or crushing them with a wire probe. But this is like the man who locks his stable door after his horse is stolen, the larvae have been feeding on the life of the trees for five or six months. The best plan to follow, if "worming" is the method adopted, is to keep a mound around the tree four or five inches high and "worm" the trees about October 10th, November 10th and March 20th. With a young orchard this method will pay well for the time and trouble of worming, but with an old orchard where the process of locating each individual is more expensive and laborious it is doubtful whether there is any economy in the scheme.

The numerous washes that are now offered for sale, are almost valueless for keeping out the borers. The reason why washes are worthless as remedies is apparent. The difficulty in applying a wash that will cover all parts of the tree is self evident. The borer will not deliberately bore into a poisoned surface, but will crawl into a small crack or under a scale and there begin drilling into the tree.

Mounding and wrapping has been recommended as the most successful method yet found for keeping the borers out. This method consists in wrapping the base of the tree with several folds of ordinary newspaper or wrapping paper for a distance of two feet from the ground and then tying it tightly to prevent the entrance of borers from the top. The wrapper should be put on the last week in July and not later than the first week in August. This inexpensive wrapper can be applied very

quickly and it will keep out from four-fifths to nine-tenths of the borers. The wrapper having been adjusted, the tree should be mounded from ten inches to one foot high by drawing the earth up to it in a conical form. In February or March the mounds and wrappers can be removed and if this is followed by "worming," the remedy is simple and effective.

Summary—A dark blue moth lays an egg which hatches, in five to seven days, into a grub; it lives in the trunk of the tree about ten and a half months, pupates, transforms into a moth living five to eight days; "worming" as a remedy is ineffectual and expensive, washes are unsuccessful, wrapping and mounding are best remedy yet discovered.

V. S. BRIGHT, '07.

EXTENSIVE AND INTENSIVE FARMING IN WEST TENNESSEE.

ONE of the most interesting phases of Tennessee agriculture is the development of trucking in the western part of the State. Everyone knows that West Tennessee is peculiarly a region of crop farming; animal husbandry has an unimportant place in the scheme of agriculture. However regretable this may be, it remains a fact, hence diversity of crops is of greater importance there than where live stock is grown. Cotton and corn have long been staples and as is usual under such conditions there are many farms that demonstrate in worn-out fields, the evils of continuous planting of the same crops.

During the past thirty years, very slowly and as yet within limited districts, there have been introduced as a part of the general farm scheme, certain vegetable and small fruit crops that today attract buyers from all the principal markets of the North. These crops collectively are known as "truck," and in West Tennessee they include the strawberry, blackberry, tomato, potato, cabbage, snap bean, garden pea, asparagus, pepper, cantaloupe, cucumber, sweet corn, spinach and onion.

In the celebrated trucking districts of Pennsylvania, New Jersey, Florida and Eastern Virginia, it is the common practice for truck farmers to confine their attention to these crops, growing only enough grain and forage for their farm animals. One peculiarity of West Tennessee trucking is that the farmers have not become exclusively truckers, but they have simply added a few vegetables to their old list of field crops.

The farmer found in tomatoes and cabbage a source of ready money early in the season, long before his corn and cotton had matured. Moreover, while most of the truck crops demand very much more labor than is given field crops, the hand work can be done to a great extent by women and children. This fact makes the truck crop a very useful one in tenant-farming, and both owner and tenant profit by the increased work provided for the tenant's family. In the tomato growing districts it has come to be recognized that a family of boys and girls is the greatest asset of the tenant.

In the trucking regions above mentioned the intensive methods demanded by plants whose value is usually in direct proportion to their earliness, are handed down from father to son, and every farmer will have served a very thorough apprenticeship before he starts into business for himself. He will have learned the use of fertilizers, of crop rotation, of tillage methods, of green manuring, in their effects not only on crop production, but also on the soil. These things will have become as much a part of his working capital, as is his knowledge of a mule and a cotton scrape to the negro tenant of a West Tennessee farm.

But when the extensive farmer, accustomed to corn and cotton, first grows an intensive crop he is more than apt to follow extensive methods; unless, indeed, he profit by the experience of some successful neighbor. It is difficult for the corn grower, cultivating thirty acres with the work of one man, to realize that three acres of tomatoes demand as much work as thirty acres of corn. Truck crops must have particular attention at every stage of their development. Since they come quickly, there is little of the latitude possible to which a full season crop has insensibly accustomed the corn grower. If the corn is not cultivated at the moment, it may not give as good a crop, but experience has taught that the corn plant will endure a few days of neglect—one may go to town today and cultivate that corn next week. But the cabbage grower who attempts this method is convinced, at harvest time, that the one essential thing is to force continuous growth in his crop; the cabbage may head if a little neglected, but the other man's crop will be just far enough in advance to have caught a profitable price; even twenty-four hours—a single day—has brought a fall in the price of truck crops that has meant failure to the belated one. In the same way the extensive farmer is apt to balk at the heavy applications of fertilizer which the experienced trucker uses as a matter of course.

Now all these things, doubtless, have influenced truck farming in West Tennessee. Today, in every neighborhood there are growers who bring to the truck crop the knowledge and industry necessary to success, and these are the inspiration of their neighbors. Many fail completely with truck crops, more succeed partially, and a few are so completely successful that they show the tremendous possibilities of West Tennessee as a trucking district. It is not strange that men whose whole experience has been with extensive crops, should require time to learn the imperative need of close attention to details, such as is requisite with intensive crops. Nor is it strange that many men, despising the day of small things, should find in the exactions of truck crops complete discouragement.

But the truck crop is teaching its lesson of the value of more work on less land to the cotton grower of West Tennessee; and in the regions where trucking is most common the bank deposits are largest, and there is a manifest improvement in crop farming of all kinds.

CHARLES A. KEFFER,
Professor of Horticulture.

EDITORIAL.

Bookkeeping on the Farm.

There is scarcely any other business in which a careful system of bookkeeping is more needed than in farming, but none in which it is more sadly neglected. The merchant knows what his outlay and his income are, what his total profit is and what per cent of profit he is receiving from each line of goods. The same may be said of the manufacturing, mining and transporting companies. All of them know just which phase of their work it pays to push with most vigor.

But the farmer is ignorant of this important information in regard to his business. He is ignorant of the amount of capital that he has invested, of his outlay, both in money and labor of himself and family, and of the income that should at least balance with all expenditures and pay interest and good wages. The farmer who makes a living for himself and family and lays up a small bank account, is considered successful, even if he receives little more than a reasonable interest on the capital left him by his ancestors and very small, if any, wages for the hard labor expended. Too often he takes for granted that a big crop, a fat hog, or rich milk means good profits, without counting the cost of production. In many cases, when records are kept, it is discovered that the well finished animal has lost money for the feeder, because he was using too expensive feeds, catering to the wrong market or selling at too young or too mature an age.

Moreover, the fact that the farmer depends upon a number of sources for his income often blinds him to the losses that he may incur from a certain crop or kind of live stock. The profitable must make up for the unprofitable. The cow producing 350 pounds of butter fat a year, must help to pay for the feed consumed by the one producing only 150 pounds.

Scarcely any one thing would have a more healthful influence on American agriculture than a thorough system of bookkeeping on the farm. There would be a thinning out of methods similar to the "weeding out" of the unprofitable cows after the advent of the tester and scales. There would often be a complete changing of rotations, the substitution of secondary for primary crops, the entire elimination of those that were unprofitable and the introduction of new plants and methods.

The Agricultural Short Course.

At this time hundreds of American young men are assembled at the various agricultural institutions taking part in the winter short courses provided for them. Though of comparatively recent origin these courses have assumed a place of great importance and are constantly

growing in favor and strength. Young men coming from the farm, or who expect to make it their home, receive inspiration, valuable information and practice that are beyond price. In fact men who have taken the short course at the University of Tennessee regard it as worth $1,000 to them from a practical standpoint, not to mention the increased pride and pleasure it has given them in their vocation.

When this issue of the U. T. Farmer reaches its readers, the short courses at the University of Tennessee will be nearly half over. But on account of the way in which the courses are divided this year, students could yet very profitably enter. January 30, courses in the study of dairying, poultry, bees and domestic science, will begin; and on February 13, the course in horticulture will begin, to end the 25th.

Any young man or woman—those of mature years are welcome—especially interested in any of the above subjects, would do well to seriously consider spending the remaining four weeks (or one-half of that time) of the short courses, at the University. There are no expenses but railroad fare and board.

Cattle Tick Eradication in Tennessee.

The work of the State Live Stock Commissioner of the Department of Agriculture in securing the release from quarantine of 15 counties and parts of counties is most commendable and should be greatly appreciated by the stock raisers and owners of Tennessee. A work of this kind brings permanent results to the cattle interests and to the general agriculture of the State that can not be estimated in dollars and cents.

Two features of Mr. Kittrell's work against the cattle tick that have been most effective are, (1) the educational campaign conducted through the agency of farmers' institutes, and (2) the recognition and acceptance of all natural conditions for tick eradication in the State.

No opportunity has been lost to present to the farmers of the State the value of live stock upon every farm; the relation of live stock to crop rotation and economic production; the part the cattle tick has taken in retarding the development of the beef and dairy interests, particularly in the infested counties of the State; and the possibility of getting rid of the tick and the quarantine by knowing something of the habits and development of the cattle tick, and adopting crop and pasture rotations inimical to tick propagation and dissemination.

Fortunately, cattle drop all ticks and are not generally infested during the winter months in Tennessee. Hence, a most excellent opportunity obtains every spring of putting clean cattle on clean pastures.

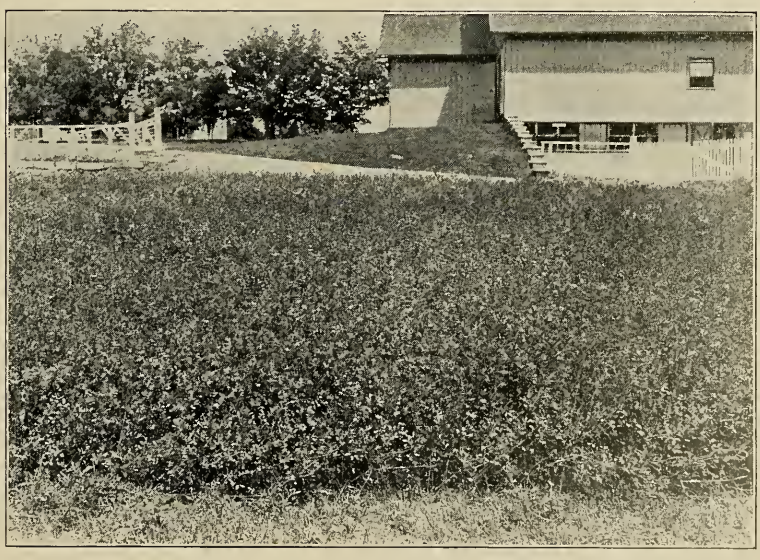
What is a clean pasture? It is one which cattle, horses and mules have been out of long enough for the cattle ticks to have died by starva-

tion. In summer this will take four months in Tennessee, in winter much longer. Farmers may divide their pastures in June or July and take the stock all from one portion for the remainder of the season in order to starve out the ticks. In early spring, while the animals are clean of ticks, they may be placed in this portion, known to be free of ticks, and kept there until the ticks in the other portion have died. Where meadows are pastured one season they may be used to turn clean stock on while the ticks in the regular pasture areas are being starved out.

In many cases where few animals are to be cleaned, and dipping vats are not available, Beaumont oil is used on cattle to clean them of ticks. The fencing of animals off the free range until the ticks have been cleaned up has been earnestly recommended and the results attained in counties where stock have been kept up, warrant this recommendation.

With the assistance rendered by the United States Department of Agriculture through the appropriations made by Congress for tick eradication, it is hoped that it will not be many years before our State Department of Agriculture can announce the entire State free of cattle tick. No greater service can be rendered the agriculture of Tennessee than the work now being done to save our people the losses that annually occur from the cattle tick and the Texas fever it transmits.

Bulletins outlining methods of tick eradication have been published by the Tennessee Experiment Station and the United States Department of Agriculture.



Alfalfa, and Section of the Dairy Barn, Agricultural Experiment Station, University of Tennessee.

THE CORN PLANT AS AFFECTED BY THE RATE OF PLANTING.

Digest of a paper read by E. G. Montgomery at the meeting of the American Breeders Association, Lincoln, Neb., January, 1906.

THE main object of experimenting in breeding and cultivating corn is to obtain the highest possible yield of grain per acre, and the fancy points, such as a symmetrical ear with well filled tips and buts, are only secondary.

Most of the results given in the paper were based upon experiments carried on at the Nebraska Station during a period of three years. The hills were planted 42 inches apart, and the number of grains per hill were varied from one to five. That is the number of grains used per acre varied from 3,556 to 17,780.

The yield seemed to favor three or four grains per hill, but the largest amount of good corn was secured from two grains per hill. The average size of the ear decreased directly as the rate of planting was increased. The yield of stover increased with the rate of planting, and the proportion of grain to stover was greatest when three grains per hill were used. A decreased proportion of grain to stover resulted in the increase of barren stalks when a thicker rate of planting was adopted and from the increase of suckers when a thinner rate was used. The per cent of barren stalks increase with the rate of planting, varying from six per cent in the thinnest planting to twenty-seven per cent in the thickest. The cause of barrenness might be briefly stated as follows: (1) Lack of vital strength on the part of the plant to produce an ear, often coupled with a lack of plant food and moisture in the soil; (2) a tendency to dioeciousness, i. e., a tendency to produce the ear on one plant and the tassel on another; (3) variation from the normal type.

Suckers develop in a responsive way to thicken up the stand where it is thin, hence their development is directly affected by the rate of planting. The average variation for two years, was from eight suckers per 100 plants when the rate of planting was four grains to the hill, to 198 when the rate was but one grain per hill. A much larger number of suckers developed in new land than in land that had been continuously cropped to corn.

The yield may often be considerably increased by suckers. At the Nebraska Experiment Station a decrease of seventeen bushels per acre was caused by removing suckers. However, if the soil is poor or the season very dry, they may be injurious to the crop.

Indications are that seed corn should be selected from plants grown under conditions similar to those of the main crop. The practice of growing seed corn in unnatural conditions is not to be recommended, but rather a selection of the best from hills containing three or four stalks and in rows the normal distance apart.

NASHVILLE'S GREAT POULTRY SHOW.

ON January 14 the greatest poultry show ever held south of New York was opened at Nashville, Tenn. Fourteen states were represented, and from 3,500 to 4,000 birds were entered. As is usually the case the Barred Plymouth Rocks predominated, in numbers, over any other breed. The display of Bronze Turkeys was the best ever seen anywhere, North or South—150 were entered. But the exhibits of birds were notable not only for quantity, but also the quality was of the highest order. And poultrymen evidenced their appreciation of this fact, in the prices offered for prize birds. The offer of $350 for a single bird, was refused.

Indeed the show exceeded all expectations. An extra judge had to be called from Chicago.

Tennessee is surely making rapid strides toward becoming the leading poultry state. The position is rightly hers and will soon be attained, if every honest effort is made to advance the cause. Good poultry shows and poultry papers, like Tennessee has, and a thoroughly equipped poultry department at the State Experiment Station, like she has not provided for, are the things that stimulate the most rapid and healthy development of the business.

LOCALS AND PERSONALS.

The Short Course men are here in full force, there being twenty-two now enrolled. The course in field crops ended on the 15th and the live stock course began the 16th. Much enthusiasm is manifested in the class and it is hoped that much good may be derived from the courses.

The U. T. Farmer extends a hearty welcome to all the "Short Horns." Following is a list of the members of the class: Hugh T. Moss, Hickman; S. V. Wolfe, Manchester; F. A. B. Roark, Birchwood; I. G. Woodard, Whitthorne; J. H. Patrick, Clarksville; Wm. N. Price, Woodford; Hugh Dixon, Madisonville; J. E. Hite, Gallatin; Chas. G. Wood, Ridgewood, N. J.; Harry P. Dalton, Carters Creek; Stephen M. Spangler, Madisonville; Jno. S. Chrisenberg, Oliver Springs; Walter M. Green, Gallatin; Grove A. Koger, Mooresburg; Aaron Fleming, Fayetteville; Charlie A. Barnes, Knoxville; Frank L. West, Knoxville; John H. Bland, Mt. Juliet; T. M. Ragsdale, Tate Springs; John H. Meyer, Hill City; Walter W. Ogilvie, Allisona; and S. M. Young, Dixon Springs.

Prof. Keffer has returned from an extended trip. He spent Christmas at his old home in Des Moines, Ia. He also went to West Tennessee to investigate "Truck" conditions of that section.

Prof. Soule, director of the Virginia Experiment Station, and formerly of this University, spent a day here on his return trip from Georgia. He delivered an interesting talk to the short course men.

On December 25 Prof. Bain left for Washington, New York and Columbus, Ohio. He attended the American Association for the Advancement of Science, at New York and the American Breeders' Association at Columbus, Ohio.

Mr. Essary also attended the American Association for the Advancement of Science, and made a pleasure trip to Boston.

On January 7 the Agricultural Club held a special meeting to welcome the short course men and to let them know that they are members while here. Dr. Ayres, Dr. Jordan and Prof. Morgan made instructive and inspiring talks, and expressed their deep interest in the short course men. Dr. Ayres said that he would be glad to do anything in his power to make their stay at the University pleasant and profitable.

Mr. W. N. Rudd, of McMinnville, was here a part of the time during the first period of the short course helping with the instruction.

'04, B. S. A.—Mr. J. E. Hite, of Gallatin, is taking part in the short course, both as a student and an instructor. He has his Southdown sheep here for the use of class in stock judging.

ITEMS OF INTEREST.

The up-to-date farmer must substitute machines for hand labor whenever possible. This is not such a hard proposition, for the inventor has been busy in bringing into existence machinery for almost every phase of farm operations. At last, the question of a reliable, quickly available and cheap motive power has been solved in the gasoline engine. The I. H. C. gasoline engines may be had in all sizes and styles, and are as good as the best.

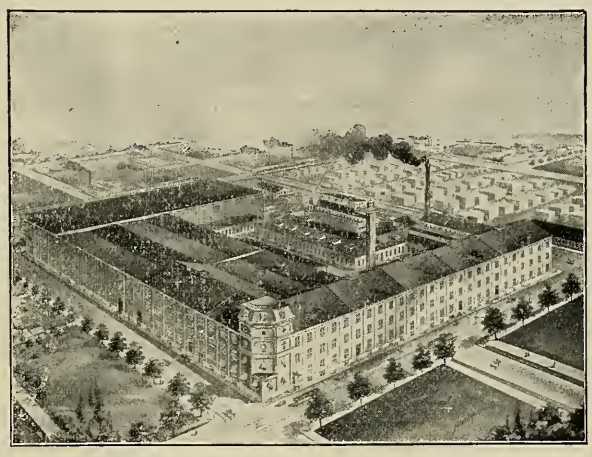
Read the International Harvesting Company's advertisement, it is full of interest to the farmers.

Any one interested in the great beef producing breed, the Herefords, will do well to write to S. W. Anderson, of Blakes Mills, W. Va., for his illustrated catalogue. His herd is one of the oldest and much the largest in the east. All of the bulls now in use were prize winners at the St. Louis World's Fair, 1904.

"Concrete Construction about the Home and on the Farm" is an interesting little book full of illustrations and valuable information about

every phase of concrete construction. By writing to Chandler & Co., any one especially interested can get one of these instructive books, free. This company's advertisement will appear in the U. T. Farmer during the rest of the scholastic year, and it is worthy of the reader's patronage.

If you have a silo or intend to build one soon, you should make a careful study of ensilage cutters. It is important that the machine be durable and capable of doing a large amount of first class work. These demands are met in the "Dick's Blizzard Ensilage Cutter," sold by McClung, Buffat & Buckwell, Knoxville. A card to them will bring circulars and prices on ensilage cutters, and when in the city you will find their store a good place to get all kinds of farm hardware.



The U. T. Farmer is pleased to show the above cut of the Hoosier Drill Co.'s plant, and is informed that large additions and new buildings are under construction which will more than double the floor space and capacity of the shop. They manufacture a complete line of grain drills, both in plain and fertilizer styles, broadcast seeders, corn planters, corn drills and combined corn and cotton drills. Their advertisement will appear in the U. T. Farmer from month to month during the scholastic year, and they can be confidently recommended to your careful consideration.

When you want your horses shod try Corum & Forester, and then become a regular customer.

We congratulate The Industrious Hen, Knoxville, Tenn., on its January issue. The Hen is truly the leading poultry journal of the South and while its pages are replete with the best of poultry illustrations and

literature, it has also several departments that are of vital interest to the farmer and poultryman. New departments recently added are "The Kennel," "Pigeons," "The Honey Bee," "Fruit Culture," and "Angora Goats." The "Turkey Department," so ably edited by Mrs. J. C. Shofner, is dear to the hearts of every poultryman. The Industrious Hen should, by all means, be in the home of every person who is interested in any of the above subjects, and we offer to send the U. T. Farmer and The Industrious Hen, both one year, for $1.15. Farmers of Tennessee, let us keep you posted through these two publications.

CONTENTS—FEBRUARY, 1907

Subscriptions, $1.00 per session—9 numbers, 15 cents a copy, to be paid in advance.

Contributions from members of the Club and from the Alumni of the Agricultural Department are especially requested.

Advertising rates made known on application. We aim to advertise reliable firms only.

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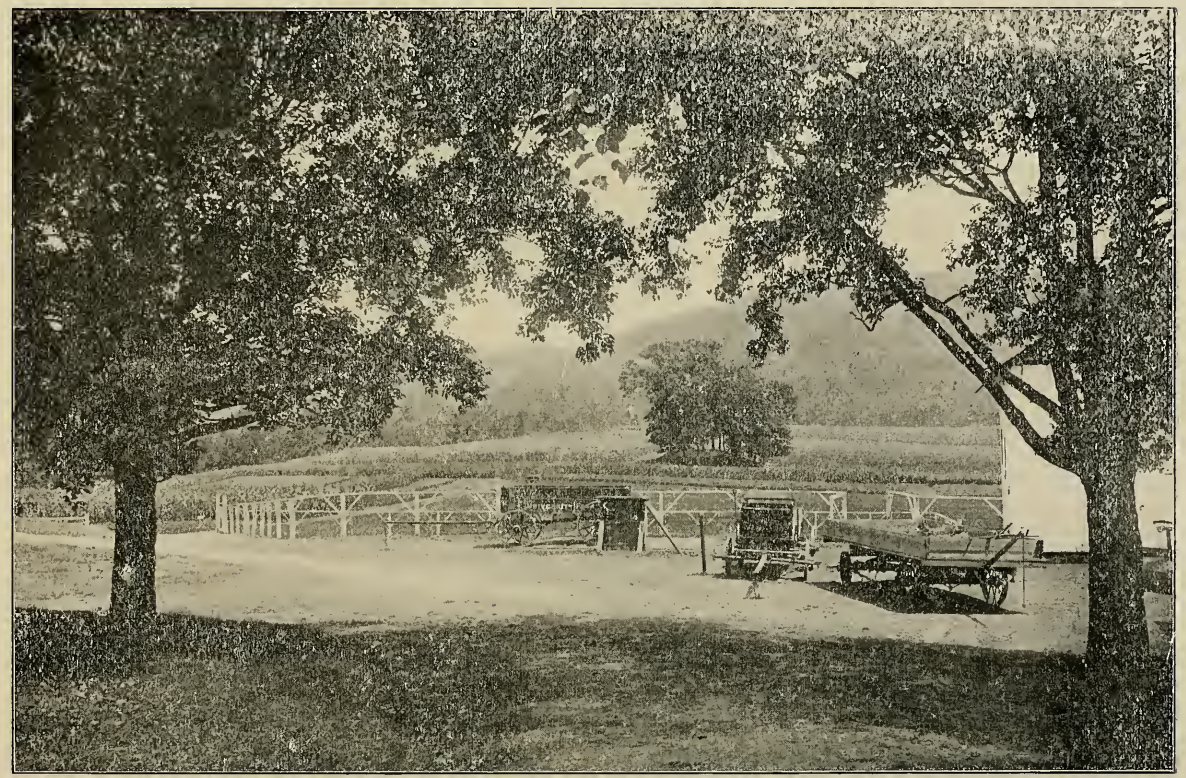

A View from the Buildings—Agricultural Experiment Station Farm.

THE U. T. FARMER

Vol. 1. FEBRUARY, 1907 No. 5

TOMATOES FOR NORTHERN MARKETS.

OVER 500 cars of tomatoes, besides what was sold in less than car lots, were shipped to Northern markets from West Tennessee in 1906. The most successful crop reported was 3,400 crates from four acres, the net returns (after payment of fertilizers, crates and string) being $1,700, or $425 per acre. This crop was handled as follows: Seed was sown in a flue hot bed between January 10 and 20, seedlings were transplanted 2x2 inches in hot bed the middle of February, and again, in cold frame, using dirt bands, the middle of March. The plants were set in the field between April 12 and 25.

The land selected was made soil in a creek bottom. It was plowed level in the fall. In early spring the field was broken with a one-horse plow, and harrowed four or five times, then it was plowed as deep as possible with a two-horse turning plow and harrowed until of the finest tilth. Just before planting furrows were opened five feet apart with a ten inch shovel plow, passing twice in each furrow to open it as deep as possible. The fertilizer (4-8-4 grade) was dropped in the furrows at the rate of from 1000 to 1200 pounds per acre—a large handful every $2\frac{1}{2}$ feet. The shovel plow was again run through to distribute the fertilizer (it would be better to have used a fertilizer distributor), through the row, and the plants were set without reference to the fertilizer, $2\frac{1}{2}$ feet in the rows.

The plants were staked as soon as set, and cultivation began immediately. The first time a double shovel cultivator was used, going as deep as possible, it was followed with a five-tooth Iron Age, until the land was very fine. Then the rows were hilled up with a turning plow, and hand raked down, after which thorough shallow tillage was given until the first fruits showed color, the last cultivation being very shallow.

The plants were pruned and tied two to three times. The first lateral shoot was left to form a fruiting branch, but all laterals thereafter were pruned out, preferably while they were still very small. From five to seven clusters of fruit were left on each prong, after which the vines were topped. The varieties used were Imperial and Beauty, planted separately. The common practice is to mix the seed before planting.

As soon as the crop is removed the field is sown to cow peas at the rate of two bushels per acre. Just before frost this crop is plowed under, using a chain, and covering as deep as possible. Tomatoes have been grown in the same land in this way for the past five years. The best crop gave a net profit of between $450 and $500 per acre.

C. A. KEFFER, *Horticulturist.*

TOMATO CULTURE.

PACKERS in Tennessee find it difficult to lengthen the canning season beyond seventy days, as the bearing period for all varieties is much the same. Consequently those wishing to lengthen the picking season resort to early and late setting. The Acme is well adapted to both.

For very early plants, make hot-beds just beneath the surface of the ground, cover the manure with soil, sow the seed and add one inch of earth. This may be done from the middle to the last of February. Have cloth and board covers for use when it is cold or rainy. It may be necessary to use the cloth until the plants are almost ready to set.

For the main crop, use New Stone, Livingston and such varieties. It is well to burn seed beds; otherwise remove an old fence or select a loose loam near water, as you may have to tide plants over a drought. Plow, harrow and rake the ground thoroughly, adding a little fertilizer. The seed may be sown from March 20 to May 20. Sow broadcast or in drills, using one ounce of seed on twenty to twenty-five square yards. One ounce of seed should make plants for an acre. Construct beds for two or four widths of canvas, which is necessary to protect plants from heavy rains, insects, late frosts, and from hail. To do this drive stakes along the sides of the beds, allowing them to stand eight inches above the ground; on these nail cross strips, and to them tack the canvas. The sides may be left open. After the plants are a few inches high, remove the cover, pull weeds if necessary, and dust with insect powders. Good stocky plants eight inches high are preferable.

Lands in Tennessee well adapted to melons, produce fine tomatoes. Some growers prefer sandy soil, containing iron. Factory men in upper East Tennessee counties, prefer a light sandy soil. But when the seasons are rainy, as in 1905-6, the rocky spurs along the foothills of the mountains gave the best results of all. Lands there, full of stones and worth five dollars per acre, yielded better crops than the French Broad river bottoms, which are worth one hundred dollars per acre. Fresh lands and clover sod tend to lengthen bearing season and give best results.

Tomato plats should be thoroughly cultivated prior to setting the plants. Mark the ground four to five feet each way, drop two tablespoonfuls vegetable fertilizer in each hill, cover with hoe and let stand eight or ten days before setting the plants. Cultivate with plow and hoe, much as we do corn. Continue until the plants fall so as to prevent plowing. Do not stop for blooming or fruiting, especially if there are indications of a grass crop. Plants have been known to give good results with shallow cultivation up to the time of ripening. It is well for pickers to walk in the same row each time, being careful not to bruise the vines.

SAMUEL DUNLAP.

NOTE—Mr. Dunlap is a veteran tomato grower of East Tennessee, and writes from experience with large acreage through a number of years.

GROWING ASPARAGUS FOR THE MARKET.

ASPARAGUS is a native of the sea coasts of Europe, and has long been cultivated as one of the choicest vegetables of the garden. There are several varieties of this vegetable, but Conover Colossal is the leading kind.

Asparagus is propagated by seed. The usual way is to raise the plants in a seed-bed and transplant them to the field when one year old. The asparagus grower should start his seed-bed with the ultimate object of producing large, vigorous sprouts. To do this he should be careful not to sow the seed too thickly. The seed-bed may be sown at any time between December and March, as they are not hurt by frost. A high, sandy or well drained soil should be selected. The ground should be well pulverized and manured before the seed are sown. The seed should be sown in drills two feet apart, and one inch deep. When the plants are good size and vigorous they should be thinned out until they stand about three inches apart in the row. At these distances one-fourth acre will grow a sufficient number to set five or six acres.

A light sandy soil, heavily fertilized, is best adapted to this crop. The more manure, the better the cultivation, the larger and better will be the "grass." After deep plowing, sub-soiling and harrowing, a coating of a hundred wagon loads of stable manure to the acre, should be turned under as deeply as possible. The land being thoroughly prepared, straight rows should be "laid off" with a two-horse plow. If the roots of the plants are long, it will probably be necessary to deepen the furrows by following the first with a smaller plow. It is best to put some good fertilizer in the bottom of the furrow before the plants are set.

The time to transplant the plants from the seed-bed to the field is when they are about one year old. The plants should be lifted from the seed-bed with a digging fork, care being taken not to bruise the roots. The distance in the row being marked off at about three feet, a plant is dropped at each place. The covering may be done with a plow, but the hoe is preferable, as the depth can be more exactly adjusted. The roots should be covered only two or three inches at first. When they have grown several inches high, the covering may be completed by adding another inch of soil.

The expense of planting and care of the crop, until it commences to make a return, two or three years later, is too great to admit of neglect. If the asparagus has been cultivated properly, its luxuriant growth will meet across the rows in the third year and smother out most of the grass and weeds during the summer. However, it should be hoed and cultivated as often as necessary to keep down those weeds that do get a start. The asparagus should be mown in the fall and the tops burned. If the plants are allowed to stand on the ground the seed will fall off and produce new plants which will be a nuisance to the old "grass." Also the burning of the plants in the fall destroys rust and often prevents great

loss from that disease. Many fields of asparagus have been ruined by not giving them attention when rust first made its appearance.

The natural habitat of asparagus being the sea coast, it is benefited by applications of common salt, which will also be an advantage in destroying weeds.

When the "grass" is about eight inches in height, it is ready for the market. The stalks are cut about two inches below the ground, with knives made expressly for the purpose. The "grass" is tied up in bunches about three or four inches in diameter; this is done by means of an apparatus called the buncher. The first cost of making a setting of asparagus with home grown plants, as above, is about $100 per acre. It generally takes $100 more to care for it until the first cutting. Asparagus sells readily in the northern markets, and some growers in West Tennessee have realized as much as $200 or $300 net per acre.

CLARENCE E. WILSON, '10.

PLANT DISEASES.

A PLANT may be diseased as the result of any one of a number of causes. Among these are the attacks of insects and other animals, the attacks of other plants, and unfavorable conditions of weather and soil. When a plant is not growing under the most favorable conditions, it is diseased. As the best of conditions is seldom possible, disease caused by unfavorable weather and soil conditions are not usually considered as such. Thus the term disease is commonly used in connection with unhealthy conditions in plants induced by the presence of other living forms growing in or upon certain parts and at the expense of them.

While plant diseases caused by the attacks of animals are of very great importance, perhaps the greatest number of the diseases preying upon the farmer's crops are caused by other plants, belonging to the group known as fungi. The fungi responsible for most of the diseases among cultivated plants are extremely small. They live on the surface of the plant and send sucking organs into the interior, or else live in the interior and send their fibers among the tissues and draw their nourishment directly from them. They are without the green coloring matter of the ordinary plants, and consequently are unable to manufacture their own food. They depend entirely upon the plants upon which they grow, their hosts. That is, they are parasites. Some of them are restricted to a single host, while others can live upon a number of kinds of plants, usually closely related species. Some of them have two or more stages in their life histories, and pass them on different hosts. The fungus responsible for apple leaf rust, for example, passes a part of its existence in the so-called cedar apples of the common red cedar, and the rest of it in the apple leaf.

All parasitic fungi multiply through the agency of very small bodies

known as spores. These spores are borne in great numbers, and are easily scattered from one host to another on account of their extreme lightness. Some of them bear spores which pass the winter in the dead parts of the host plant, such as dead leaves, twigs and fruits. They germinate in the spring and start the infection anew. Some spores cling to seeds. They are planted with the seeds and grow along with the young plants, producing disease later. The life histories of many disease-producing fungi have been worked out by investigators. Their manner of growth and reproduction being known, it becomes possible to combat many of them successfully. At present much is being done in this line by men in our experiment stations.

The old saying that an ounce of preventive is worth a pound of cure is certainly true in the case of plant diseases. Preventive measures include selection of clean, healthy seed, and seed from non-infected districts. It is often advisable to take the further precaution to disinfect the seed before planting to kill any spores which may be on them. The selection of hardy and disease-resistant varieties is also of importance as a preventive measure. It is a well known fact that certain varieties of cultivated plants are proof against diseases ordinarily destructive to those plants. Crop rotation is also important. The ground may become infected with fungi destructive to certain crops. The destruction of all dead parts of infected plants is a valuable preventive measure. Burning of refuse matter of orchards, plowing under wheat stubble and burning wheat straw, are strongly urged, where the plants were diseased the previous year, in order to destroy the winter spores of fungi. Weeds and other disease-harboring plants should not be allowed near growing crops. Early spraying to prevent the beginning of diseases in orchards, is one of the most valuable preventives known.

After the fungus causing a disease is already established, efforts are directed either to kill it off, or to prevent its spread to other plants. Spraying is perhaps the most common combative measure in use today. The necessary limits of this paper will not admit a discussion of the numerous sprays and methods of application. The reader is referred to the bulletins and spraying calendars of this and other stations for information on the subject.

In conclusion, the importance of the subject may be emphasized. The great loss to the farmers of this state through a lack of knowledge concerning plant diseases and the remedies for them, makes it one worthy of the closest study. Hundreds of thousands of dollars are annually lost to Tennessee farmers through fungous disease. There is need for much popular instruction. It should be taught in our public schools along with other agricultural subjects. It should be discussed more fully in our farmers' conventions and in agricultural journals. There is a demand for more literature on the subject of a nature that the farmer may be able to read and understand. Most books treating of plant diseases, as is too often the case with other diseases, are too technical for the ordi-

nary reader. The various agricultural stations throughout the country and the United States Department of Agriculture, are accomplishing an immense amount of good. Their publications are free to the farmer. It is to them the farmer must turn for information about plant diseases and such remedies as have been discovered for the same.

S. H. ESSARY,
Assistant Botanist and Mycologist.

TOMATO GROWING FOR THE CANNING FACTORY.

TOMATO growing is an art, and to produce paying crops one must get the "knack" of it—that is the "know how," discernment, and well timed effort, a full knowledge of which can be learned only by experience. Make up your mind to give the tomatoes a fair trial, some of the best land on the farm and sufficient attention and cultivation, just at the right time—and do it—or let them entirely alone. When properly grown and marketed they are usually a paying crop, and it is ordinarily the man who does not half attend to them or neglects them for other work on the farm, who declares that they are not profitable. However, tomatoes must be grown and marketed under favorable conditions to pay, like every other crop; and ordinary common sense, at least, ought to be exercised to determine whether this is so, before attempting to grow them on an extensive scale.

Below are some conditions necessary to successful tomato growing for the canning factory.

A Suitable Soil—Tomatoes succeed on a great variety of soils, but it must be fertile, well drained, and friable. As a general rule any good corn land—land which will yield forty bushels of corn per acre—will produce good tomatoes. If the previous crop has been clover or cow peas, so much the better. Turn the land early and work it down fine before planting. A good complete fertilizer, pretty strong in potash, applied broadcast by a grain drill just before setting or at time of sowing, will usually pay.

A Good Road and Not Too Long a Haul—Tomatoes weigh 60 pounds per bushel, by factory rule, and are easily bruised and mashed, hence the hauling is quite an item when much business is done.

A Good Market—A good reliable buyer is much to be desired and a good price finishes the deal. A few years ago in this section tomatoes could be grown and delivered to the factory, if the distance was short and the roads good, at a fair profit, at twenty cents a bushel. I think it could be done now, for twenty-five cents, and pay current wages, where all the conditions are favorable.

Labor Available—By field seeding and the use of good implements one man can easily grow five acres of tomatoes. To reset from the plant bed will require about two extra hands for about a week, if done by hand.

If the yield is good, it will require about three hands, for nearly a month, to properly gather and deliver the fruit to the factory, a mile away, and clean up bad fruit.

Variety to Plant—It is important that tomatoes for the canning factory be large and smooth, not pitted or irregular in shape, as this makes the peeling more difficult, and the waste greater. In Maryland and Virginia, I think, Stone, Paragon and Livingston's Perfection are mostly grown. My experience has been altogether with the Acme, an old standard, from which I selected my own seed and developed a fine strain. By saving seed from only large, perfectly sound and regular fruit, one gains much in quality and avoids a fruitful source of rots and fungus disease in the future crop.

The Plant Bed—In Northern sections, tomatoes for the factory are usually sown in carefully prepared plant beds, about April 15 to May 1, and transplanted to the field about June 1. The bed is usually made long and narrow, so as to be covered by a strip of muslin or other cloth, as a protection against late frosts and to prevent the surface baking after a rain before the plants are large enough to cultivate. The seed are usually sown in rows in the plant bed to admit of cultivation.

Transplanting—This can be done quite rapidly by hand when the land is in proper condition, but is now rather generally done with machines, I think, in the great tomato growing sections. I do not know which machine is best. Ask the seedmen.

Cultivation—The cultivation of tomatoes for the canning factories is very much like that of Irish potatoes. If the rows are straight, a good riding cultivator can be put close enough to them while young, to make the hoeing and weeding a light job. Cultivate shallow after the plants get up and continue until they are in bloom and begin to fall, then stop. No staking or tying up is done.

Gathering—The factories usually furnish and lend slatted crates, holding about a bushel each, to be used in gathering and hauling the tomatoes. The field should be gone over at least every other day, when ripening. Blighting plants and rotting fruits should be promptly removed and deeply buried, especially during the early part of the season.

Field Seeding—Col. A. B. Bowman, of Johnson City, who operated the first canning factory in East Tennessee, according to my information, used to say, that tomatoes could be grown successfully here by seeding direct into the field. Two years ago, I put in an eight acre field that way, which produced, I am sure, at least, 200 bushels of good marketable tomatoes per acre, at a cost of about 16 cents per bushel, including gathering. The ground was good red clay loam, clover sod, capable of producing forty bushels of corn per acre in an average season. It was turned deep and well in the winter, disc-harrowed deep, and worked down fine before planting. About May 1, I planted the seed by mixing them with fertilizer and sowing through a wheat drill. Let fertilizer run through all the tubes, but seed only through the second tube on each side of the drill,

which makes the rows 3½ feet apart. This may be done by partitioning off these cups in the box. Use a good complete fertilizer. Adjust the drill by actual trial and measurement, so that each cup will feed one pint of fertilizer to each two hundred feet of row. This would put about four bushels of fertilizer per acre, if the drill lapped. Put a gauge on it and drive so as to put all the rows just 3½ feet apart. If the tomato seed are stuck together in little bunches, rub them apart thoroughly with the hands and put them through a sieve of proper size to separate them. Sieve the fertilizer also, if it is at all lumpy, mix one ounce of tomato seed to the gallon of fertilizer to be used in the seeding tubes, and mix it well. This will require about eight ounces of seed per acre, and will put one seed about every two inches in the row, which is about thick enough to allow for all contingencies, and chop out to a stand of 15 to 18 inches.

Be sure your seed is good. Better test it or have it tested, if at all doubtful. Tomato seed retain their vitality several years, if properly cared for and protected from mice, insects, etc. 160 to 200 bushels per acre is, I think, a fair average yield to expect in a good season and under favorable conditions.

PAUL F. KEFAUVER.

NOTE—Mr. Kefauver was for several years connected with the agricultural experiment station, University of Tennessee, and is still a most loyal friend of the institution.

OCTOBER FLOWERS FROM OUR GREENHOUSE.

JACK RAISING.

THE subject of raising jacks for profit is a big one to deal with and an attempt will be made only to relate in a general way some of the practicable methods by which they may be handled with profit and pleasure to the owner.

In the first place a man must like this particular kind of animal and never feel too proud to take off his hat and bow to a good jack (or mule) that he may have in his possession or with which he may come in contact. The same rule holds for this kind of business as in all others—a man must be in love with his work. No one should think that he can "plunge" into jack raising and get rich in the course of a few years, by growing a few individuals that will bring from $400 to $900 apiece at three years of age or under.

In the beginning one may find it rather difficult to get the jennets that will be most profitable. When buying a jennet do not overlook her color, conformation and breeding. In regard to color it is true that black jennets with white points give better satisfaction and are more desirable for breeding purposes than grey ones of the same size. However, if you can secure at a reasonable price, a high-bred blue or gray jennet of three-quarters black blood, it may be well to make the purchase as you are going to breed to a black jack so that her offspring will likely be of the proper color. Yet it is well to consider the great popularity of black specimens.

The beginner should commence raising jacks in a small way. It is much better to begin with two or three jennets and gradually increase the number as experience and education are obtained.

One of the most important problems that come before the breeder is the selection of the male to which the jennets are to be bred. Study them and learn their weak points so as not to breed to a male that is deficient in the same respects in which they are lacking. Granted that the jennets have been bred to a good jack, there is a period of eleven months through which to wait for results. But all this time they should be kept where they will not be hurt and lose all your profit by aborting or having colts to come dead or out of shape. By and by the colts are foaled. Now comes the time for the keeper to exercise his skill in caring for and handling the young jacks.

The jennets that have female colts will not need particular attention and care, only plenty of feed to keep them in good order. But those with the male colts will demand the best of attention to get the most money out of the jacks. "Push" them for all they are "worth"—it pays every time. Never let them stop growing or get poor.

At from six to eight months of age they should be taken away from their mothers, and this is the time when, through carelessness or ignorance of their keeper, many jacks, and other young stock as well, are stunted and checked for all future development. When the colts are taken away from their mothers, they should be put into a stable and given plenty of green matter along with their other feed.

It is better never to let the jacks see or run with jennets after once separating them, until they are about four years old and have acquired a permanent liking for mares. This is done by putting filly colts with them that are somewhat older than they. They should remain together until the jacks get to be so large and rough that they might hurt the fillies.

When they are separated from the fillies they must be kept to themselves. They may have a separate pasture, if it is during pasturing season, and should be fed some grain every day. While they are running out during the spring and summer, careful attention should be given their feet to keep them trimmed and in a good growing shape. Do not let any little sores get started on them, for many fine large jacks are damaged from lack of attention in these respects. It should be remembered that comparatively slight blemishes may reduce the price of a good individual to the extent of from $100 to $200.

When the jacks have to be kept in the stable most of the time, they should be let out every day to exercise. Nothing pleases the breeder better than to go to the stable and turn them out and see them trot around the lot with action like high-strung mules. They should run together as long as possible, for they will ride each other around a great deal, thereby gaining much strength and vigor in their limbs. And when jacks have been developed in this way, it is a rare thing to find one weak in his hind quarters. On the other hand, many that were reared separately have been known to get weak in their limbs after having stood in the stable some time.

It is better to have some horses around when young jacks have to be kept up. Do almost anything to teach them to like mares. This is a very necessary part of their training.

When about three or four years old, if they have been properly cared for, they are at the most profitable age to sell. They should bring from $500 to $1,000. And it is rather risky to hold them for a slightly higher price, as a variety of accidents may happen to them to lessen their value.

W. L. FOWLER, '09.

EDITORIAL.

THE STATE UNIVERSITY.

The state realizing that its power, honor and perpetuation depend upon the character of its people, wisely begins the training of its prospective citizens in childhood. The wisdom of this practice has come to be rarely questioned. Rather the theme that now agitates the minds of the people is, What can be done to make the public schools more efficient? And this is well, for the best thought of the ablest minds should be brought to bear on the subject of the education of the child and youth.

But granted, as is done, that it is right and proper to give the boys and girls, in the public schools, a good foundation upon which to build the superstructure of an advanced education necessary to the specialist or the well informed man, the state finds itself confronted by the additional duty of providing the best possible opportunity for its young people to fit themselves for their respective positions in the commonwealth. This is entirely logical; the same reasoning that justifies and demands the existence and adequate support of the primary and secondary public schools, demands an institution in which the education may be completed and by which the lower schools may be made better. The state must have specialists, trained and thorough—lawyers, farmers, doctors, engineers and teachers, and there are many young people of all stations, often poor, who are eager to prepare themselves for these lines of work. And this climax of the public school system, this result of a natural demand, is attained in the state university. There young men and women from widely separated homes, from a great variety of conditions of life and preparing for all of the leading businesses and professions, come together on equal footing and pursue their specialty, and at the same time have the advantage of the broadening influences that come from association with professors and students of the various courses.

Moreover, not only does the state university equip its students for their respective lines of work, but it is also a source of valuable information to the entire people. The farmer, manufacturer and teacher are all greatly benefited by the investigation and research done at this institution. In this respect there is room for almost unlimited expansion of the scope of the field of operation of the state university. Extension work in the leading industries is becoming an increasingly important part of the duty of the head of the public school system. In agriculture this movement is making the greatest strides. It is becoming apparent that thoroughly sincere, capable and energetic men sent out by the university to be at the service of the farmers, answering questions or referring to authorities along particular lines and giving seasonable advice, would mean a saving of hundreds of thousands of dollars to the people.

So the duty of the state to support its university, is as binding as the duty to support its lower public schools. And this obligation works

no hardship; an appropriation for higher education is not a gift, but the most paying investment. The money so used is repaid many times over in more effieient professional and business men, in more prosperous industries, and in healthier and happier homes. In fact, the work done by the state university for farming interests alone, more than justifies its existence and the expenditure of increasingly large amounts of money in making it more effieient.

Indeed it is too intimately eoncerned with the interests of the whole people, directly or indirectly, and too good an investment, crowning our otherwise incomplete public educational system, to be treated niggardly or merely allowed to exist. It is the institution that should be most loyally and substantially supported that all may receive the largest blessing from it.

Part of the Dairy Herd on Blue Grass Pasture.

ECONOMIC VALUE OF MUSSELS IN TENNESSEE WATERS.

Pearls.

THE species of mussels which produces pearls may be found in nearly any limestone river, but, of course, their quality and abundance are dependent upon several things—climatic conditions, temperature and depth. Those from which the finest Tennessee pearls have been taken, were found in warm shallow water near the bank. The Clinch and the Holston rivers have been the most productive of pearls in Tennessee, and some very fine ones have come from the French Broad recently. A gentleman in Knoxville, who deals in these pearls, told the writer that, last season he sold two pearls taken from the Holston river for $2,200.00, which shows that they compare very favorably with those great pearls found in other parts of the United States.

During the warm months men go out and camp on the river bank and search for pearls. They use long-handled rakes or hoes to dredge for the mussels. When a number are taken up, the shells are pressed apart with the hands if possible, though they are generally so tightly clamped together that a strong knife is required to open them. The pearls are taken out then and shipped to a dealer. The shells of this species are too thin for buttons and are not used commercially, though they may be put to some local use, if taken out in sufficient quantity, for roads or some similar purpose.

Quite often the finest pearls are found by field laborers who, while resting during the heat of the day, wade out into the shallow water and dig up mussels with their bare feet, taking them up with their hands and opening them with their pocket knives.

Of course it is a very uncertain business, conducted by the present hap-hazard methods, any many thousands of mussels are destroyed that yield no pearls. It can scarcely be called an industry yet, there has been no effort made towards the cultivation of the mussels or the production of artificial pearls—nor even any legislation to protect what is already here, the gift of nature. This is really one of the richest resources of our rivers, and it is certainly time for a thorough investigation of the subject. It should be studied intelligently and steps taken for the preservation of this species of mussel which otherwise must eventually become extinct. The artificial production of pearls is very simple, a small hole is drilled in the shell and a particle of sand or glass inserted. This becomes coated with nacre, a secretion of a certain gland in the mouth of the mussel, in just the same manner as natural pearls are made. Pearls vary greatly in color, shape and size, but the finest are those clear white or pink ones, regular in shape, oblong or round, and having great lustre. Sometimes, however, the very irregular shaped ones or those of peculiar color or markings, are valuable on account of their rarity.

Pearl Button Industry.

This is more of a possibility than a reality in Tennessee at present, though there are good reasons for believing that we have sufficient resources in our rivers for the establishment of this valuable industry.

The shells are procured in many different ways, but there are two devices which are generally preferred. One of these is known as the Crow Foot drag, which consists of an iron rod from eight to ten feet long, to which are attached a series of short lines, each having numerous four-pointed hooks. The other is much simpler, being a rake with a net attached, into which the mussels fall when disturbed.

The shells are put into large tanks of water and soaked for ten days, then they go to the saw where they are cut into discs or blanks, as they are called. These blanks are then classified, after which they are ground to the desired thickness, shaped, and the holes drilled in them. After this they are put into an acid bath to remove all unevenness in the surface and give them polish, then put on a revolving drum where the final polishing is given them by friction. They are then sorted by hand and the first grade carded and put into boxes and sold to manufacturers of high grade goods. The second, third and fourth grades are sold to jobbers for the retail trade, very few of the first grade being sold at retail.

The remains of the shells, after the buttons have been cut from them, are generally used for making roads, though they are sometimes ground for grit for poultry or used as a covering for roofing.

They are dug from natural beds at all seasons of the year, sometimes in the North the ice being broken for this purpose. There has been some talk of having a closed season for the protection of the mussels, but at present there are no laws governing this industry, though there is obviously great need for them. As these mussels are found in nearly all the rivers of the United States, and especially in the Mississippi and Ohio and their tributaries, Tennessee certainly presents an inviting field for the development of this industry.

After showing thus briefly the value of mussels in Tennessee waters, it seems clear that it would be decidedly advantageous to the people of this state to make a study of them from a scientific as well as practical standpoint in order that these great resources might be developed.

LENA B. HENDERSON, '08.

NOTE—The information in regard to pearls and pearl buttons was procured for this article directly from dealers in the same, the latter from the owner of a factory.

THE SAN JOSE SCALE—Aspidiotus perniciosus (Comst.)

THE most destructive pest to the fruit grower is a minute insect which lives upon the sap of the infested plants. This insect was introduced into this country, on nursery trees, brought from northern Japan in 1870. Its first damage in America was discovered in California in the town of San José from which place the insect has been named the San José scale. Due to its occurrence upon fruit trees and ornamental shrubs it is readily transported from continent to continent and different parts of the same country. In the United States and Canada, this most dreaded of orchard pests has disseminated until today it may be found in nearly every section of the country. Volumes have been written upon its life history and its ravages until there remains nothing new to be added. It is important, however, to continually discuss this

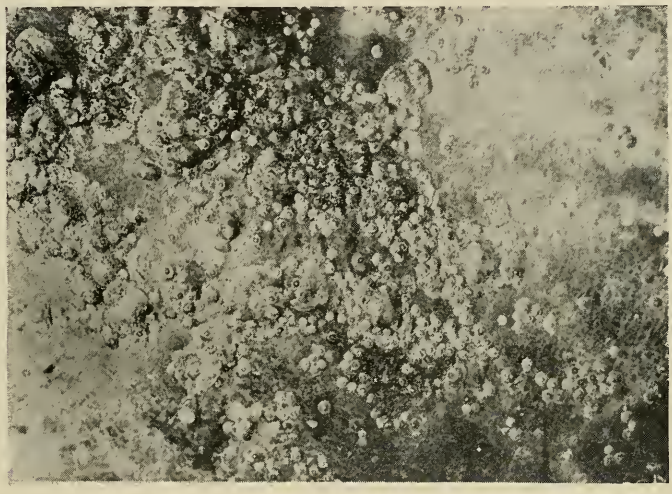

FIG. I—A GROUP OF SCALES OF DIFFERENT AGES, SLIGHTLY MAGNIFIED.

scale and try in every way to acquaint the fruit grower of its appearance and to instruct him how he may combat it most effectively.

The San José scale belongs to a large family of highly specialized insects whose habit it is to remain the greater part of their life affixed to one place on a plant. Excepting for a few days their existence is passed underneath a scale like covering consisting of fused together wax and cast skins from the insect's body. Beneath this protection, which is closely sealed to the bark, the small, more or less flattened, yellowish insect lives. Its mouth parts consist of long bristle like tubes adapted for sucking. These are slowly worked through the bark to the sap beneath from which it draws its sustenance. In size the mature scale is one-sixteenth of an inch in diameter, or about the size of the head of a common pin; when young it is scarcely larger than the point of a pin. The scale occurs in

two forms, the more or less circular scale is the female while the elongate scale is the male, in Figure II these forms are plainly shown. The young scale slowly crawl about on the branches and twigs for a short time, then they begin working their bristle-like beak into the sap of the young growing wood. It is only a short time before fine filaments of wax exude from different parts of the body. Later these run together and with the cast skins make up the scale or covering of the insect. Figure IV shows several of these newly formed scales. At this time these scales are very small and usually of a dark color. In about thirty-three or forty days the young mature and begin the second generation. The females, when grown, produce living young and the males become delicate two-winged fly-like insects. In Tennessee the San José scale has five generations annually. Thus one readily sees how quickly a slight infestation may increase in a short time. The importance of an early treatment is evident.

Fig. II—Adult Female Scale in Center; Young Female Scales at Right; Two Young Male Scales at Left; All Highly Magnified.

To determine the presence of San José scale one has to observe closely. When looking for scale it is best to have a good hand magnifier which may be taken into the orchard. Frequent searches should be made for the scale. The figures accompanying this article are from Bulletin No. 193 New York Experiment Station, Geneva, N. Y. They show the scale at different ages, and notwithstanding their enlargement they should furnish a good idea of the appearance of San José to those not acquainted with it.

The food plants of the San José scale are many. Not only are most of the fruit trees liable to attacks but in like manner forest, shade trees and shrubs. Of the fruit trees the apple, peach, plum and pear are the ones most seriously affected. The injury results from the loss of sap

due to the feeding of the scale. An infested apple tree, if not treated, may withstand the injury for four or five years but the peach tree succumbs to an attack in much less time, usually in two or three years. In spite of the possible infestation by San José scale and the serious injury resulting therefrom, the writer would not for a moment discourage tree planting. It is a significant fact that only the neglected orchards are hurt by this scale. By intelligent effort the San José scale can be *easily controlled*. When the fruit grower comes to realize that an annual application of the Lime-Sulphur wash will reduce its ravages to the minimum, then no anxiety or loss need be felt.

Remedy—The Lime-Sulphur wash stands far at the head of all remedies now known, for its efficiency in killing San José scale and its cheapness of preparation. So valuable is this spray for other reasons that its use is warranted and should be more generally applied even in orchards where San José does not occur. It is distinctly a winter spray and should never be used except when the trees are dormant. The wash is not only

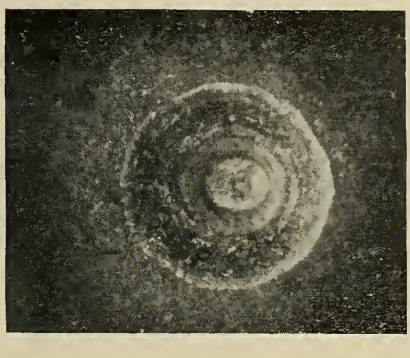

Fig. III—Adult Female Scale, Highly Magnified.

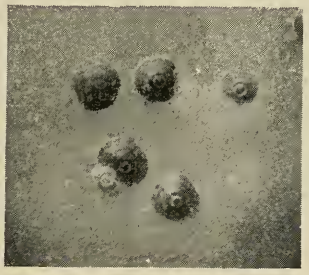

Fig. IV—Young Scale Highly Magnified

a destroyer of many wintering forms of insects in the egg, pupa and adult stages found upon the trees, but is also a very efficient fungicide. If applied to peach trees just before the buds open in the spring, it is a preventive of peach-leaf-curl and applied to apple trees it is a satisfactory substitute for the first application of the Bordeaux which is usually recommended for that time.

An efficient formula for making this Lime-Sulphur wash is:

Quicklime	21 pounds.
Sulphur (flowers or flour)	18 pounds.
Water	50 gallons.

To make this wash put about five gallons of water into a large iron kettle or boiler so arranged that heat may be applied; into the water place the lime, a lump at a time, now add the sulphur which has previously been thoroughly mixed with water to form a thick mash. Add water from time to time to keep the mixture from boiling over and to retain a good boiling consistency. This wash should boil from 40 to 60 minutes, then

dilute to make 50 gallons, and apply while warm. The application is made by use of a good spray pump furnishing a fine misty spray. The nature of this equipment will depend largely upon the amount of work to be done. The bucket pump is to be recommended for a few trees and a good barrel pump for an orchard of fifty or more trees.

By using the above mentioned spray, following the directions carefully, beneficial results are sure to be forthcoming whether scale is present or not.

Every one growing trees or shrubs should learn to recognize this destructive San José scale and be prepared to combat it, since it may appear at any time in city lot or commercial orchard.

G. M. BENTLEY,
Assistant State Entomologist.

BEE KEEPING FOR FARMERS.

THIS paper is not intended for the specialist, the professional bee-keeper, but for the farmer who wants to keep a few colonies of bees for his own use and perhaps to have a little surplus honey for sale. In the first place buy a good book on the subject and study it thoroughly. "The Honey Bee," by Langstroth, revised, is very likely the best for the purpose. As to the hives, I would advise the Dadant hive, as it is the only one having a brood nest of sufficient size. What constitutes a brood nest of sufficient size is fully explained in "The Honey Bee." Smaller brood nests can be used with good results, but require more attention and more manipulations.

Put the hives in a shady place, a grove of trees not too far from the house is the best place. Water should be handy, not running water, but some kind of a wet surface where the bees can get a foothold and sip the moisture, even if it is nothing but wet earth.

Put the hives on benches about 18 inches high. Have the bottom boards level and projecting 10 or 12 inches in front of the hives. That arrangement saves the trouble of keeping the ground perfectly clean, and also saves some annoyance from toads, ants and the like. The queen breeders and other bee-keepers who handle their combs very often, prefer to have the hives on the ground, because some of the very young bees that can not yet fly, may fall on the ground and might fail to get back into the hive, if it were up on a bench. At least that is what they claim, but I have some doubts about it.

You can make the Dadant hives yourself. They are quite simple. If you do, dispense with the straw mats, but make the cover double with some packing, chaff, straw or paper. That kind of cover protects the bees against the cold in winter and against the extreme heat in summer when the sun shines on the hives.

The frames in the brood nest should be wired and filled with foundation to avoid an excess of drone comb. Those in the super need only a

narrow strip to start the bees. The honey in the brood nest should not be taken, but when it accumulates in the super, cut it out and put the frames back. A little bit of comb should be left under the top bar to start the bees again.

Buy the bees wherever you can. They will likely be in box hives. In spite of what the bee books say, there is no need of going to the trouble of transferring by the usual process. Just wait until the box hive colony swarms, and then put the swarm into the new hive and place it where the box hive was. The box hive should be placed elsewhere at some distance. Twenty-one days later, the old box hive can be demolished, the combs and honey (if any) disposed of and the bees united with those in the new hive.

The greatest difficulty is the swarming question. Unfortunately the bees swarm at a time of the year when the farmer is busy with far more important work. I have given a good deal of thought to the subject and would advise the following as the best way of controlling swarming: When the swarming time comes, put on each hive a queen trap. Be sure to leave no holes, anywhere, through which the queen could pass. When the bees swarm, the queen will remain in the trap and the swarm will return. Toward night or whenever it is convenient after the swarm has returned, the queen should be destroyed. That will stop the swarming for a few days. Later the young queens will begin to hatch and swarming will be resumed. The same process is repeated until swarming ceases. Then the trap is removed to permit the remaining queen to come out and mate. If any increase is desired, it can be made artificially by division, for by that system no swarm is hived separately.

If it is desired to hive the swarms separately, it can easily be done. Before the swarm returns move the hive to another place and put a new one in its place. As soon as the swarm has returned release the queen and let her go in with the bees. The swarm is thus on the old stand. If the hive is too heavy to be carried bodily, which is usually the case with the Dadant hives, just take out the combs and carry them to a new hive on a new stand. The super should be left on the hive that is on the old stand.

ADRIAN GETAZ, Knoxville.

A TRIBUTE TO AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

Governor Albert B. Cummins says:

"The United States presents so many instances of extraordinary and unparalleled growth that most of our people do not know what institutions devoted to the science of agriculture are doing for the material welfare of the country. I believe it to be true that the knowledge imparted by such colleges and the interest awakened through their efforts, has added more, in the last decade, to the wealth of the nation than all other discoveries combined. This may seem to be a startling assertion, but in truth it is exceedingly conservative. I take a single illustration among many that are in mind: The information that has been given within the last five years to the corn

growers of Iowa with respect to the selection of seed corn, added this year not less than sixty million bushels to our corn crop. That is to say, we raised and harvested sixty millions of bushels more upon the same land than we would have raised and harvested under like conditions, had not science lighted up the way to better farming. All other agricultural products have been similarly advanced and the aggregate good accomplished is as astonishing as it is gratifying.

The study of agriculture has done something else even more important than to multiply production. It has ennobled and dignified the labor of the farmer. It has lifted up his calling to a higher rank among men, for his work now occupies his mind, as well as his hand. Under its inspiration, nature has unfolded new beauties, and the slice of earth that falls so gracefully from the plow has become to the boy who turns it more than a strip of black soil. It has made country life more interesting, and the country home more attractive. The result will be a check upon the tendency of bright, ambitious lads to leave the farm and the old folks for the gilt and glitter of towns and cities. In these days, books and papers are as necessary to the farmer as his agricultural implements—not story books nor political papers only, but scientific books and scientific papers. In a word, the farmer of the future must be a scholar. He must be a man of learning, not for embellishment but for efficiency."—*Farming*.

LOCALS AND PERSONALS.

S. S. Smith & Bros., of Whitesburg, kindly loaned the University some cattle to use for judging during the Short Course. These, with the station herd of 20 beef cattle, afforded the students excellent practice in scoring and placing them.

Among the practical and experienced dairymen, who were enrolled for the dairy course, were G. W. Duncan, of Cleveland, and E. P. Dargan, of Sweetwater.

S. E. Barnes, former dairyman of the University of Tennessee, assisted with the instruction during the dairy course.

The course given in bee culture, though not largely attended, was full of interest to those who were present, and a steady growth of this department is expected. The following practical bee men were here to get the benefit of the course, and incidently added to its interest by giving some of their experiences with certain phases of the business: David Wauford, Alexandria, DeKalb County; Charles A. Smith, Rogersville, Hawkins County; J. T. Allen, Fountain City, Knox County, and Adrian Getaz, Knoxville. Some of the meetings on apiculture were held at night, so that the four year agricultural students and short course men, taking the dairy course, might attend.

Profs. Morgan, Keffer and Bentley attended the meeting of the State Horticultural Society at Nashville.

The first two weeks of February were busy ones at the dairy building on the farm, on account of the short course in dairying. There were 17 young men taking the work this year. This is a good showing compared with former years, but should be at least doubled in 1908.

S. M. Sprangler, assistant in plat work at the Experiment Station, had a pleasant visit from his brother, Charles Spangler, the first of the month. The latter is a former short course man, and is now farming on the home place, near Madisonville, Monroe County.

The experiment in steer feeding, which will soon be completed, promises to give some interesting and valuable results on the superiority of soy beans for beef production.

An experiment has been started in which five different combinations of feeds are being tested for their value in pork production.

The dairy department will soon begin an experiment on the feeding of cows. In this experiment several different combinations will be used.

On January 29, the Agricultural Club had a call meeting for the election of officers. The following men were chosen: President, E. F. Fuller; Vice-President, V. S. Bright; Secretary and Treasurer, W. M. Landess.

The Club had a regular meeting on the evening of February 13. Prof. Essary made a very interesting and instructive talk on "The Clover Fungus Disease."

The course in home economies, given as a part of the short course, was very thorough and was well attended—about 25 ladies were enrolled. Such encouraging results will likely cause it to be offered again next year.

During the third period of the short course upwards of 50 students were enrolled. Students as well as the faculty were kept very busy, and the interest maintained and the good work done, are most gratifying. Many of the students stayed for the course in horticulture and a number of new names were added to the list.

CONTENTS—MARCH, 1907

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Contributions from members of the Club and from the Alumni of the Agricultural Department are especially requested.

Advertising rates made known on application. We aim to advertise reliable firms only.

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Jerseys Coming Home for their Evening Meal.

THE U. T. FARMER

Vol. 1. MARCH, 1907 No. 6

SPRING BREAKS ON THE FARM.

There's a warm wind wooes the woodlands and the maple blushes red,
There's melting snow beneath the feet and blue sky overhead;
A touch of green upon the hills that cateh the southern sun,
The flieker of a blue bird's wing to tell us Spring's begun.

The eerie music of the frogs shrills through the misty air,
And glad, live things are erying and calling everywhere.
The wheat fields glow like emerald, the willow's turning green,
The glad, freed waters sparkle their bare brown banks between.

The woods take on a tender green beneath the sunny sky,
And lightly, brightly flitting, see the first blue butterfly.
The sweet young wild flowers lift their heads with faint elusive charm,
The glad time of the year is come—'tis springtime on the farm.

ROSE OSBORNE SELL, Charleston, W. Va.

SELECTION AND BREEDING OF CORN,

With Some Cultural Notes.

Compilation made by the Senior Class in Plant Improvement.

The following bibliography was used in preparing this paper: Bulletins No. 96, Md.; No. 170, N. J.; No. 7, Minn.; No. 91, Neb.; Nos. 67 and 77, Iowa; No. 17, Kan.; Nos. 54 and 76, Ga.; No. 22, Div. Plant Pathology; Nos. 55, 82, 87 and 100, Ill.; Reports of 1902-3-4, N. D., of 1904, R. I.; Report State Board of Agriculture, Kan., by Shamel; Circular No. 19, Mo.; Year-Book, 1900-04, Tenn.; Science, Vol. 13, 1901; a number of papers in the American Breeders' Association Report, Vols. 1-2, 1906.

Field Corn.

INDIVIDUALITY OF THE EAR.

In breeding corn pedigree counts just as it does with cattle or hogs. Individuals that appear to be exactly alike, as far as external appearance is concerned, may differ widely in their productive ability. And such assertions are not theories, but demonstrated facts that may be illustrated by a few examples. Ears selected from the same crib and the same variety when planted in rows side by side in the breeding plat, have returned yields that varied from 35 to 85 bushels to the acre. But not only does the individuality of the different ears become evident in the yield but also in the vegetative habits of the plants. Corn selected from the same field and planted in the breeding plat presented marked differences from the time it began to break through the ground until the crop was harvested. In an experiment where 100 ears, of one variety, were planted in separate rows in the breeding plat, there were differences in date of germination; at maturity the progeny of some ears were two feet taller than that of others, and some rows ripened ten days before others.

But it is only necessary to go to the average corn field to see evidence of different potentialities of different kernels of corn of apparent external equality. Where there are three stalks in the same hill, how often No. 1 bears a large symmetrical ear, No. 2 a small ear and No. 3 a nubbin. This illustration has been noticed so often by the average corn grower that the cause is rarely asked. However, there seems to be but one logical reason for the great difference in the ears borne by the stalks in the same hill, that is inherited characters. The ancestors of No. 1, if they were known, would most likely predominate in large ears and the same could be said of the progeny of the other kernels from the same parent ear. If on the other hand, the progeny of the other kernels from the ear that produced No. 3 could be found, they would likely have a predominance of nubbins. The cause of the different sizes of the ears from the same hill must, as has been said before, be due to qualities inherent in the individual kernels and hence in the parent ear, for soil and cultured conditions are the same for all three plants.

And this matter of the superiority of one ear over another is of great importance, for fourteen good sized ears will plant an acre, and so one ear of bad ancestry may materially reduce the yield of the acre. It is estimated by conservative men, that a bushel of well selected seed corn is worth, to the grower, from $25 to $35 more than a bushel of inferior seed. Moreover, it is only when we take in consideration the work of careful investigators that we see how comparatively scarce thoroughly reliable and good strains of corn are. In testing 5,000 unrelated ears, Mr. Funk found only two strains—progeny of two ears—that have given uniformly high yields from year to year. These strains possess certain characteristics that are regularly reproduced in a certain per cent of their progeny. So it is evident that, by the average method of selecting seed corn, only a small part—if any at all—of the kernels will be of a superior strain, similar to those represented in the two ears out of 5,000.

BARRENNESS.

From the practical corn grower's standpoint, nubbins and barrenness are about equally objectionable, the latter being the most unprofitable. And here again only when actual count is made, does the farmer realize what a comparatively large per cent of his corn plants are unproductive. Prof. Holden estimates that one stalk in every seven is barren —one acre out of every seven produces no grain—and it is likely that in the poorer lands of the South the percentage is even higher. This condition can be greatly improved. If barren stalks are not allowed to produce pollen in the breeding plat, the tendency will be greatly reduced.

INBREEDING.

The question of inbreeding has scarcely occurred to the average corn grower, but the work of the plant breeder has demonstrated that vigor and yield have been reduced by fertilizing the pistils of a corn plant with its own pollen. When in the breeding plat, alternate rows have been detasseled, the yield of the detasseled rows has been increased at the rate of ten or twelve bushels to the acre, and, what is of more practical importance, greater strength has been placed in the embryo of the cross bred kernels, so that better results will follow in the succeeding crop. In his work with Hickory King corn, Dr. Webber got some interesting results in regard to inbreeding. Hickory King seed, produced by self pollination, yielded forty-six ears per 100 stalks, weighing 9⅓ pounds: while kernels in every way similar except that they were produced by crossing with pollen from other plants of the same strain, yielded 82 ears per 100 stalks, weighing 27½ pounds. In another case where an attempt was made to fix some hybrids of Hickory King and Peruvian corn, some plants were self-fertilized while others were fertilized with pollen from other stalks of the same hybrid. In the first case there was almost total sterility and a marked loss of vegetative vigor was apparent, but

in the second case the plants were healthier and the yield seemed to be but little reduced by the close breeding corn.

BREEDING FOR CHEMICAL COMPOSITION.

Although the work of the plant breeder in increasing the yield ranks first in importance, the power to select and breed strains of corn possessing higher chemical content of the desired substances is becoming of increased interest and significance. Two important facts have led to the breeding of corn for chemical composition, namely: an ear of corn is approximately uniform in composition throughout, and there is a wide variation of the composition of different ears of the same variety. This variation may range from 7½ to 16 per cent in protein content; from about 3 to 6 per cent in oil, and from about 75 to 87 per cent in carbohydrates. And strains have been produced that uniformly rank high or low in these substances, accordingly as one or the other have been bred for. So when we consider the varied uses that are made of the corn plant and its products, we see the great practical importance of breeding for chemical composition. The feeder wants a corn high in protein and would pay more for it, the starch factories want grain high in carbohydrates, and the oil factories will pay five cents more per hundred pounds for corn one per cent higher in oil.

METHODS OF BREEDING CORN.

In a general way the methods used by the experiment stations in breeding corn may be adopted by the average farmer. The expenses of breeding seed corn are very light when compared with the increased yields and improved qualities that are obtained.

SEED.

Much has been said pro and con in regard to the using of home grown seed and seed from another section of the country, but the consensus of opinion seems to favor the former, as a rule, or seed from the same latitude so that acclimatization will not be necessary.

The selection of the seed corn should be made in the field where the height and strength of the parent stalk, the number and placing of the ears, the number and quality of the leaves and the length of the shank and character of the husk may be observed.

From the ears gathered from the field, as above suggested, another selection should be made based on symmetry of ear, direction of rows, spaces between rows, size of cob, proportion of grain to cob, depth, soundness and shape of kernels. But too much stress should not be placed upon fancy points, for yield of grain is the ultimate object of breeding and selection and we do not yet know what type of ear will give the biggest returns. If chemical composition is to be bred for, selection should be made accordingly. High protein content is indicated by a

large amount of horny part; low protein by a small amount of horny part; high oil content is indicated by a large germ; low oil by a small germ; and high carbohydrate content is indicated by a large amount of white starch. The above conditions are determined by making longitudinal and cross sections of a few grains from each ear.

The seed corn should be carefully cured in racks in well aired rooms, so that there will be no excessive moisture in the grain when the freezes of winter come.

Before the corn is planted some grains from each ear should be tested in a germinating box and those ears of low vitality should be rejected.

LOCATION OF BREEDING PLAT.

The breeding plat should be located in soil of uniform quality throughout, so that difference in fertility will not be a disturbing factor. It should be placed at considerable distance from any other corn fields to prevent cross pollenation—pollen may be carried one-fourth of a mile or further, by the wind. However, if it is impossible to isolate the breeding plat, it may be placed in the center of a corn field of the same variety, and what is still better, have selected corn planted around it.

PLANTING.

Each ear is numbered and planted in a separate row, and the same number of plants are allowed to each row. As far as possible the conditions are made the same for the entire plat, so that the only disturbing factor will be the individuality of the different ears.

Since experiments definitely show that inbreeding in corn is injurious, alternate rows are generally detasseled and the seed is saved from the detasseled rows. Also barren stalks are not allowed to mature pollen.

Observations regarding dates of germination, vigor, height, date of tasseling and dates of maturity are made throughout the growing season. Some of the rows may often be discarded before they have formed pollen.

When the corn is ripe, several ears are selected from the best rows according to the method previously mentioned, and weights of grain and stover are made for each row. Some of the ears may be discarded as soon as husked, because of the arrangement and spacing of the rows, the character of the kernels and the per cent of grain to cob. But as has been indicated before the most important consideration is the total yield of grain per row. Moreover, other ears will most likely be thrown out after the germination test has been made.

The records kept show the number of ears per row and their weight, the weight of grain and stover per row, the number of bushels of grain, and the number of tons of stover per acre, the average height of each row and the date of maturity, and if chemical composition is bred for, the protein, oil and carbohydrate contents should be recorded.

Sugar Corn.

Many farmers get their seed sugar corn from the North, claiming that it is sweeter and that a constant change of seed is necessary to prevent deterioration. But these conclusions are not confirmed by the large growers and packers. One grower who has used home-grown seed corn for sixty years says, that the acclimated variety gives best results, and that sweetness depends upon variety and not upon climate. These conclusions—in regard to yield and vigor—are confirmed by experiments conducted in Maryland and New England. When New England seed corn was planted at home and in Maryland the yield was 40 to 60 per cent higher in the former than in the latter place. However, when in both cases home grown seed was used, the yields, as well as the quality, were practically equal—higher yield in the South if any difference.

The seed should be very carefully selected. The grain should be deep, narrow and well shrivelled, when dry, and have a translucent amber appearance. The rows should preferably be straight and the silks white. Of course when sweet corn is grown for the market, the yield is an important item, and there is a great difference in the productivity of varieties. The Roslyn Hybrid—a cross between Stowell's Evergreen and Burr's Mammoth—yielded in Maryland 700 two pound cans more to the acre, than any other variety.

The important quality of earliness, in sweet corn, is affected by time of planting. When seed is saved from the first plants to mature of the early planting, the corn becomes larger and later. But if the seed is saved from the very latest planting that will mature, the strain will become dwarfer and earlier. In regard to seed corn another important consideration seems to develop from the results of the Rhode Island Experiment Station. One lot of seed was selected from upper ears and another from lower ears. The results indicate that the progeny of the upper ears are more prolific in that a smaller per cent of their offspring are barren and a larger per cent have more than one ear to the stalk. The difference is likely due to the fact that the upper ear is produced first and thus is more certain to be vigorous and will transmit this character to the offspring.

The imperfect germination of sweet corn that is so common, is largely due to fermentation and freezing of the imperfectly cured seed. These conditions are avoided by using the following method in curing the seed corn: In the early morning the corn is cut, at noon it is husked and stacked, and at night it is placed under shelter; the ears are placed on racks, in thin layers, so as to allow the air to circulate freely among them; and when the cob is thoroughly dry, the ears are placed in barrels and covered with wire gauze.

Rate of Planting.

The experiments conducted at the North Dakota Experiment Station, in 1902, indicate that the best yield of stover could be obtained from

corn drilled in rows 12 inches apart, and that stalks 6 inches apart in rows $3\frac{1}{2}$ to $3\frac{2}{3}$ feet apart gave the best yield of grain and stover. The following year the station tested the difference between drilled corn and that planted in hills. Corn planted 42 inches apart reached the height of 5 feet, while that drilled 6 inches apart reached the height of 3 feet, though the yield of fodder was much greater in the latter case. It was also learned that where more than two stalks per hill were used, there was a decrease in the per cent of ripe corn.

In Nebraska cooperative experiments with corn were carried on by the farmers in six sections of the state. The localities were selected on account of their varying climatic conditions. Each farmer had 14 varieties of corn and enough seed of each variety to plant one-fourth of an acre. In the germination test the per cent ran from 85 to 100 per cent. These experiments extended through three years with the following results

Morrill Hall, the Present Agricultural Building.

summarized: The heaviest yielding varieties are those bearing medium sized ears; four stalks per hill give best results in wet years and three in dry years; four stalks give best results in good soil and three in poor soil; as the number of stalks increases the size of ears decrease; two stalks per hill produce the highest yield of good ears, per acre; as the number of stalks per hill increases, the stover increases; three stalks per hill give the best proportion of grains to stover; the number of tillers differs with the soil, rich sod land produced 134 tillers per 100 stalks and poor cropped land produced 61 tillers to the same number of stalks; to every 100 plants four stalks in the hill gave eight tillers, three gave twenty-five, two gave seventy-six and one gave 198 tillers; and 17 bushels more were obtained where tillers were left on than where they were removed.

THE GROWTH OF ECONOMIC ENTOMOLOGY.

IN the early days when the country was still new and the soil yet in its virgin state of fertility, and when the acreage of any one crop was not large and the fields more or less isolated by forests, little or no attention was paid to the depredations of insects. The farmer had only to consider the insects which were native to his region and these were usually held in check by their natural enemies. But these conditions gradually changed as the country became more and more thickly settled; as the forests were removed and many insectiverous birds were driven away by the destruction of their nesting places; as the farmers begun specializing in some crop well suited to that particular region, thus increasing its acreage; and as a result of our increasing commercial activity we begun to receive insect pests from foreign countries, there was a more or less rapid increase, not only in the number of individuals of the destructive species, but also in the number of species which preyed upon the farmers crops. It was at that time that economic entomology had its beginning. Previous to this an entomologist was usually some busy doctor or other professional man who collected and studied insects as a hobby and from pure love of the work. He did not expect, much less receive, any pecuniary return for his labor. The entomologist of that time was a systematist, i. e., he studied insects in order to learn their relationship one to the other and paid little attention to their relations to man, or the crops and animals upon which the farmer depended for his livelihood.

To Massachusetts belongs the honor of being the first state to apply, in an official manner, the knowledge possessed by the entomologist to the insect problems of its citizens. This was in 1837 when the Governor authorized Dr. T. W. Harris to collect data and issue a report upon the economic insects of that commonwealth. The report was issued in 1841. New York and Missouri followed soon after and since that several other states have fallen into line.

In 1877 the U. S. Entomological Commission was created and its members instructed to study the then great insect problems and recommend methods of controlling the pests. Their first work was upon the Rocky Mountain Locust and the Cotton Leaf Worm. As a result of the efforts of the three men on this commission there were devised methods of control in each case which have resulted in untold benefit to the farmers of the regions formerly devastated by these insects. In the case of the cotton worm it has been conservatively estimated that the damage caused by this insect, in one year alone, amounted to over $30,000,000.00. But today, so efficient are the methods of control that none but the shiftless, careless farmer fears the presence of this one time scourge.

From this humble beginning of three men there has been developed the present U. S. Bureau of Entomology with its corps of 55 trained men

concerned with a wide diversity of problems from the boll weevil of Texas and Louisiana to the gypsy moth of New England.

Nor has the growth in the numbers of working entomologists been entirely within the U. S. Bureau of Entomology, for with the establishment of experiment stations in the several states and territories, there has been an ever increasing demand for men trained in the science of applied or economic entomology, until today in 41 states there are employed in the experiment stations alone 64 men who are studying insects with the one idea of devising means of control which the practical farmer may successfully apply under his local conditions. The station entomologists are studying, not only the insect enemies of the farmers' crops, but are also investigating the many pests which prey upon his live stock, and within the past few years have turned their attention to the working out of the life histories of those insects which serve as hosts for the conveyance of diseases of man and animals. This is well illustrated in the contribution of entomology to the control of the yellow fever and malaria mosquitoes and Texas fever or southern cattle tick. In each case the remedy applied was based upon the knowledge of the life history and habits of the particular insect under consideration.

Perhaps the most prominent phase of economic entomology is that of the enforcement of the quarantine laws, of the different states, against the introduction of dangerous insect pests and the eradication of those which have already obtained a foothold.

The San José scale, which was accidently introduced into this country about 1870, has been responsible for most of the laws of this nature, for nearly all of them are directed primarily against it, but usually include several other species which are occasionally destructive but not universally so. There are now 41 states and territories which have laws, on their statute book, directed against the introduction or spreading of noxious insects, and of this number 25 appropriate annually the sum of $153,000 for the enforcement of these laws. In the other 16 states the expense is borne by the local districts benefited or the work is supported by a system of fees. In addition to this one state alone is expending $160,000 annually in their efforts to control two insect pests.

If we inquire the reason for this rapid increase, for the greater portion of this wonderful growth has taken place within the past ten or fifteen years, we learn that the economic entomologist is dealing with problems that vitally affect the welfare of a large portion of the people, and therefore is necessary to our modern civilization. When, because of the soil and climatic conditions of any region the cultivation of one crop is found to be more profitable than that of any other it is almost a certainty that the resulting enormous increase in the food supply of the insects feeding upon that particular crop will cause a like or greater increase in the numbers of these insects and in time it will be absolutely necessary to devise some means of relief from their depredations or to cease growing that crop. This has been demonstrated many times over in the agriculture of America.

Then again when a heretofore harmless or slightly injurious insect has been introduced from a foreign country and becomes excessively destructive, the absence of its natural enemies and the invigorating influence of a change of climate render it necessary that man shall develop means of combatting it, and as all rational remedies are based upon an accurate knowledge of the life history of the insect against which they are directed there is created a demand for trained practical entomologists. This condition was actually brought about by the appearance of the San José scale in the United States and has been twice repeated since, first when the gypsy and brown tail moths were introduced into New England and again with the appearance of the Mexican cotton boll weevil into Texas and Louisiana.

Another factor which has exerted a strong influence in bringing about this rapid expansion is the strong competition which has grown up between the different agricultural regions of our country for the possession of the markets. The consequent narrow margin of profit requires that the losses formerly occasioned by insect depredations shall be prevented, and here again the knowledge possessed by the entomologists is in demand, and, moreover, this latter demand is one that must increase as time goes on, for it will not long be possible for the farmer, when confronted with some serious insect devastation, to move on to a new country and thus once more be free until the insect in its steady onward march shall overtake him again. It is becoming more and more necessary for the farmer to fight for his crops and the entomologist of the future will find his best field in aiding the farmer in this battle.

E. C. COTTON, Assistant Entomologist.

MULE RAISING IN TENNESSEE.

THE mule, on account of his peculiar adaptation to the climate and conditions in general, is of the greatest importance to the Tennessee farmer. Here the average farmer can handle mules on a larger scale than horses and with more likelihood of being successful.

Size, good bone, plenty of style and finish are things that the breeder should strive to attain in his mules. The two latter qualities have made the Tennessee mules famous, and have been given to them by their dams, the Standard-bred mares.

However, the average Tennessee mares are hardly large enough for producing ideal mules. So their size should be increased by crossing them with larger sires. But care should be taken not to destroy the fine quality and style that is now characteristic of the Tennessee mares, for this would result in coarser mules which are not so popular on the southern markets.

At the time the mule colt is taken away from its dam it should have been taught to eat grain, for it will thus be much easier to wean and will not lose flesh during the process, if properly cared for. It is very import-

ant that the colt be fed some succulent food at first, such as green corn. Its grain ration should be rich in protein and lime, so as to promote a healthy growth of bone and muscle. Oats and bran, half and half, with some good hay, high in protein, such as alfalfa or red clover, make an excellent feed for the first winter. As a rule too much corn is fed to young mules. It is high in carbohydrates, and so has too great a tendency to fatten unless fed in very small quantities.

It must be remembered that a mule will seldom outgrow stunting the first winter, and even if he does, he will have to be kept longer to mature. But if he has passed through the winter in good condition, he should do well on pasture during the spring and summer.

During the second and third winters the mule should be fed very much like the first, but some corn could be substituted for a part of the bran, and of course the entire ration should be increased. He should be kept growing all the time, so as to be mature and ready for the market as early as possible.

The mule can be worked a little the fall after he is two years of age, and, if properly cared for, he can be used regularly the next spring and summer. However, it should be remembered that he sheds his pinchers at three years of age, and so should be given food that is easily chewed.

He should be in a good condition to put into the fattening pen, the fall after he is three years old, to be made ready for the winter market.

This way of handling mules, getting them ready for the market at past three years of age, has proven very satisfactory and profitable to some southern farmers. However, where older animals are needed, it will sometimes be profitable to keep them longer.

WALTER OGILVIE, Short Course, '05 and '07.

A SIMPLE METHOD OF TESTING SEED CORN.

THERE are several methods of testing corn, all of which depend upon the same principle, namely, that of supplying sufficient moisture and warmth to the kernels to cause them to sprout. One of the simplest ways of sprouting seed is to take a common dinner plate and fill it nearly full of sand. The sand should be as clean and white as possible, for the seed may not sprout well if it is placed upon sand containing much organic matter, as mould might be present. After the sand is placed on the plate, it should be moistened. Do not saturate the sand with water, for, if it is too wet, the seed will not germinate for want of air.

Having the sand properly placed and moistened, the kernels to be tested should be pressed into it, small end down, in the order that they are taken from the ear. At least four kernels from each ear should be tested—one from each end and two from the center. In a dinner plate of average size, kernels of about fifteen ears may be tested. The kernels

from each ear—four in number—may be separated by means of wires or strings stretched across the plate. Each division should be carefully marked so that a complete record may be obtained.

After the kernels of corn are all placed as described above, they should be covered by a second plate to prevent too rapid evaporation of moisture from the sand. They may then be left in a warm temperature to sprout. As fast as they are well germinated, they should be removed from the sand and a careful record taken of the number which have

Some Germinated Kernels.

sprouted. The best temperature for the germination of corn has been proven by experiment to be 77 degrees F.

This method of using the plates of sand for germinating corn is very practicable in that any farmer can use it without purchasing any new material. This may seem like a very simple and unimportant practice, but if it is carefully done the "stand" may easily be increased from 5 to 10 per cent.

ALBERT T. ANDERS.

THE DOG LAW TRIED IN A TENNESSEE COUNTY.

THE General Assembly of the State of Tennessee recently enacted a dog law which, for four years, has been in force in Sumner County. This law provides: that the running at large of unregistered female dogs is a public nuisance; that the grand juries shall have inquisitorial powers of all offenses committed in violation of this act; that any person owning or keeping a female over three months old shall be guilty of a misdemeanor; upon conviction shall be fined not less than $5.00 nor over $20.00; and shall pay all costs. The registration fee is $3.00, which must be paid to the circuit court clerk, whose duty it is to procure a book for recording and procure leather collars with metal tags attached, on which is stamped the register number of the animal. After deducting cost of collars, tags, etc., and a fee of fifty cents for the clerk, the remainder must be placed to the credit of the common school fund.

That this is a step in the right direction no one can doubt. The object being to reduce the number of dogs, and thereby to bring sheep husbandry into a prominent place in Tennessee agriculture. As elsewhere, we suppose, the majority of dogs (females) were owned by the poor classes who

were unable to pay a tax on them. Moreover, they were not able to feed the worthless dogs that they kept. Consequently these under-fed animals gave a great deal of trouble to the flock owners. Night and day they traveled around through the country, often making hazardous raids that might dishearten the staunchest shepherds.

Naturally, anything that reduces the number of dogs will be heartily accepted by the sheep men. And from observation and inquiry we find that there are few female dogs among the poorer classes in Sumner County where they were formerly very numerous. Our farm is only two miles from Gallatin, and it is very seldom that we see a "stray" around. We do not maintain that the sheep-killing dog has gone, but that the owners of flocks are at less risk.

Since April 30th, 1903, two hundred and ninety (290) female dogs have been recorded in this county; excepting well-bred hunting dogs, this number swells slowly. At every meeting of the grand jury a few unrecorded dogs are found.

Since the bill was passed to encourage sheep husbandry, why should the money, that accrues from registration, not be used to secure the owners when they suffer a loss by dogs? As a suggestion succeeding the above question we think the following would be just and stimulating to sheep husbandry: Require losses to be reported to circuit court clerks immediately after they are sustained. The clerk shall appoint an appraising board, composed, for instance, of the justice of the peace, constable and a prominent farmer of the district where the loss occurs, which shall report damages to him. This should be paid from the dog tax fund. And when the dogs that do the killing are found, their owner should be prosecuted at next term of circuit court to reclaim damages already paid out by the circuit court clerk.

To make this paper complete we should show how the total number of sheep in the county has changed since the law became effective. Statistics on this point are not available but the number of sheep has apparently decreased rather than increased. This is due, however, to the better prices for which breeding ewes have been selling, in the past few years. The strong market in the spring and early summer has drawn lots of ewes to the shambles that should have spent their lives on the farm as matrons.

J. E. HITE, B. S. A., '04.

GRAZING AND FEEDING STOCK.

IT is evident that in the growing of good stock a system of feeding must be followed that will not be too expensive, for it is useless to place on the market an animal that will sell for less than the cost of production.

I should therefore assert that, next to proper breeding, good grass should be placed, as the most important factor in preparing live stock for market.

Few Tennessee farms have enough grass. It is the natural food of our domestic animals, and if furnished in abundance and of a good kind, it will put stock in excellent condition with little other feed. Owing to the shortness of our winters we should be enabled to have plenty of grass for our live stock for most of the year. A large part of Tennessee is adapted to blue grass, and where that king of grasses can be successfully grown it should be raised in abundance and should be well cared for. Orchard grass and alsike clover can be successfully grown on almost any soil in this state that is fertile enough for the production of a crop of any kind of grain.

These grasses make an ideal pasture. After you have secured a good stand, the important thing is not to crowd too much stock on your grass. Let it grow in the spring while the weather is temperate and rain is plentiful. Let it cover the ground, and it will protect the roots from the burning rays of the summer's sun, so that it may grow even in the hot weather.

Beef Cattle on Pasture.

Grass is also more nutritious, if it is given time to mature. Grass that grew last night will be worth little to a steer today. We may add much to the length of our grazing season by growing forage crops for winter, like rye and crimson clover. It is almost impossible to produce good spring lambs without good winter pasture.

The addition of a grain ration to the grazing will generally prove profitable. There can be no doubt that all kinds of stock can be fattened more cheaply by feeding when on grass in summer than in any other way.

Try feeding a little grain to the colts in summer and see how much it improves their growth and quality.

Try feeding grain to the steers while on good grass and see how quickly they will mature into good beef

Try feeding the hogs on grass in summer and see how much cheaper

pork can be produced in this way than by an exclusive ration of corn after the weather is cold.

An alfalfa field is an ideal place in which to feed hogs. Two or three ears of corn fed each day to a hog running on an alfalfa field will make a good animal for the packer or butcher by the last of summer, at which time the price is usually high. Ten or a dozen ears fed each day to a thousand pound steer that has been well wintered will make an export animal by October or November, if he has had all the good grass that he needed during the season.

Let me again urge you to have more and better grass. Do not waste your corn by injudicious fall and winter feeding, but keep it for wintering your stock in good condition, and finish them on grass in summer.

A concentrated feed like oil meal can often be used to advantage in finishing prime cattle, but with good grass and corn, only a very small amount can be used economically.

The demand for grain-fed mutton is so strong that a grain ration can be profitably used in feeding sheep, but we should endeavor in this climate to have grazing for them at all times.

The profitable production of live stock is not the only advantage in raising grass, for it helps to solve the ever present trouble of labor and also adds to the fertility of our lands. Then grow grass and good stock and you should be richer and your farm will be more fertile in the end.

W. S. PORTER, Petersburg, Tenn.

EDITORIAL.

NATURE STUDY IN THE PUBLIC SCHOOLS.

The magazines published by the agricultural students in the various state universities are having a good deal to say about agriculture in the rural public schools. In fact the natural consequence of a young man taking this course in some university is to cause him to realize vividly that the children in the community from which he came should be given a peep into the beauties, the mysteries and the great truths of nature; that the great mass of children and youths are failing to use, enjoy and be benefitted by the best things of country life. And though the U. T. Farmer would leave to the educators the adjustment of the public school curriculum, it is convinced that along with history, geography, arithmetic and physiology, the pupils should be given lessons in animal and plant life, should be taught from the start that only a small part of what is to be learned is in books and that he who would be truly educated must observe and reason out things for himself.

The results from teaching the child to observe, study and love the the growing plants, the insects, the birds and other animals, are not in the far distant future, but are immediate. Dull days are enlivened and disappointments forgotten, if the eyes of the child are opened to the intensely interesting and fascinating world about it. How much of distaste for the early lessons in farming—hoeing corn, pulling weeds and driving cows—would be removed and replaced by enthusiasm, if a real interest were created in the farm animals and plants. If the children were so instructed, there would not be as much dissatisfaction among young men and women with the routine of country life. The love for their surroundings should grow with their years, if they were made to realize the fact that the greatest, most beautiful and best things are not concentrated in some cities or in some far removed region, but are in nature as manifested in plants, butterflies, birds and people. That nature as expressed in the despised weeds or insignificant insects that usually crawl about unseen, is as grand and profound as in the wonders of electricity or of a Niagara.

Such conceptions of country life would keep many young people from leaving the farm in search of excitement, wealth and distinction, which they had learned to look for in some other occupation than that of their fathers. Of course where natural talent or inclination leads them to some other profession or business than agriculture, then they wisely follow their bent, but the majority belong on the farm and should be taught to properly appreciate the magnitude of their occupation and how to get the most out of it in every right way.

Lessons in observation and scrutiny of individuals, whether of plants or animals, would give the pupils greater pleasure in their every day life

and prepare them to be more successful in growing crops and fattening live stock. When through the childhood and youth they have been taught to question the practice of every day life and to search for the "why," they will be much better prepared to solve problems for themselves and to have definite and well founded reasons for their practices in after life. When the "why" is known the "how" is much simpler.

Moreover, the young men who all along through their public school life have been taught the simpler but essential truths of nature, who have been taught to make the intimate acquaintance of some of the common plants and animals, will be on the alert for information about them. Indeed it should be the duty of the teacher to make those in his charge acquainted with the agricultural literature. The bulletins, both state and national, should be explained and some of the best agricultural papers and books of the same nature (but, of course, not too difficult) should be recommended at the proper time and to the right persons. And to aid the pupils in their reading, some of the common terms of agricultural literature should be explained as fully as possible, such as carbohydrates, protein, potash, ammonia, etc. This last is a consideration of no little importance, for it is very hard for some subjects to be understood unless the reader has at least elementary knowledge of these technical, but indispensible, terms.

Such training in early life would cause many to seek the preparation for farm life that can be had only in the agricultural colleges. Indeed, it would be the greatest boon to these institutions. It would result in more students and in students better prepared to get the most out of the course. This latter consideration is one of great importance, for under the present rural conditions, students come to the agricultural colleges to study botany, zoology, animal husbandry, etc., who do not know the parts or function of a single flower, the difference between a spider and an insect or the economic importance of either, or what the tenderloin of the beef is and the value of it. The whole thing, from the elementary matter up, must be taught to them, and that to minds which have not observed.

But even when country boys and girls intend to adopt some other occupation than farming, the instruction in nature studies is none the less valuable, for it is as much a cultural study as any other that is taught and is useful to men and women of all professions. Lawyers, doctors, or engineers would have a better conception of life in general, if they would first become acquainted with life as manifested in plants and animals, and would be able to get more pleasure out of their existence.

AMERICAN BERKSHIRE CONGRESS.

The annual session of the American Berkshire Congress, held at Springfield, Illinois, February 20-21, was well attended and was in every way a success. "Papers were presented by the most successful breeders, exhibitors and sellers of Berkshires and every topic of interest to the practical and progressive swine breeder was freely discussed by the large number present." The U. T. Farmer is particularly glad to note that the next session of this Congress will be held at Nashville, Tennessee, and that J. M. Overton, of Nashville, is vice-president of the organization.

THE U. OF T. APPROPRIATION.

THE Fifty-fifth General Assembly of the State of Tennessee recognizing the state's responsibility in providing for the higher education of its young manhood and womanhood and the need of substantial support for economic research work along lines where individual efforts are inadequate, tripled all former appropriations and quadrupled any previous appropriation for the University of Tennessee and the State Experiment Station. This $100,000 that the Legislature has so wisely invested is not for any set of individuals but for every Tennessean. The son of the day laborer as well as the son of the banker may demand an education at the State University, and the owner of a few acres may share with the largest plantation owner the advantages of the investigations made by the Experiment Station.

A Correction.

An awkward typographical error that "slipped through" in the last issue, should be corrected. In the article "Economic Value of Mussels in Tennessee Waters," the word "mouth" occurred where "mantle" should have been. The nacre is secreted by glands in the mantle and not in the mouth.

Book Review—Prof. C. A. Keffer's book, "Nature Studies on the Farm," sold by the American Book Company, has recently come from the press. This little volume, in a clear and concise manner, discusses the origin and structure of soils and the relation of plants to the soil, underground water, the relation of the forest to the soil, what the plants "eat," weeds and how they spread, "the plants business," seeds and how to sow them, buds and how to make cuttings, transplanting, the orchard, the cereals, the meadow, reasons for plowing the soil and for cultivating and hoeing the crops, a number of interesting little talks about some special plants and about plants in general, and suggestions to teachers who may use this as a text-book. Nature Studies on the Farm is especially adopted for children in country homes and schools.

It is written so simply and interestingly that the boys and girls on the farms can readily understand its lessons and must surely be fascinated by its stories of plant life.

"The San José and other Injurious Scale Insects of Tennessee with Methods for their Control," is the title of a new bulletin by G. M. Bentley, of the Department of Zoology and Entomology, University of Tennessee. This bulletin deals chiefly with the San José scale, which is by far the worst pest of our Tennessee fruit growers, giving its history of occurrence, habits and life history, how it spreads, its food plants, nature of the injury, its parasites and natural enemies and what is being done in Tennessee to control the San José scale.

Under the head of remedies the writer has given clear and explicit information regarding the very latest facts, based on experiments, about sprays, their formulae and methods of application; also the use of hydrocyanic acid gas in fumigation.

Besides the San José scale the bulletin includes descriptions, life histories and remedies for the oyster shell scale, the scurfy scale, the cottony maple scale, the rose scale and the apricot scale. By means of these descriptions and the twenty-two accompanying illustrations the reader can easily recognize the different forms. This bulletin may be had upon application to Agricultural Experiment Station.

SHORT WINTER COURSE IN AGRICULTURE A GREAT SUCCESS.

FOR a number of years the University of Tennessee has offered short winter courses in agriculture. Up to last year the courses were so combined that it was necessary for a student to take the entire eight weeks to get the work of a particular subject in which he was interested. There was such a demand for special courses in diarying, agronomy, animal husbandry, horticulture, etc., that the University authorities thought advisable to divide the courses into definite units and during January and February, 1907, the unit ystem was given its first trial. The courses were arranged as follows: Agronomy, 2 weeks; Animal husbandry, 2 weeks; Dairying, 2 weeks; Poultry, 2 weeks; Bee culture, 2 weeks; Domestic science, 2 weeks (the last four courses in progress during the same two weeks), and Horticulture, 2 weeks.

The unit system offers many advantages. Persons wishing to specialize in any one course may do so without spending more than two weeks at the University. With the general scarcity of labor now prevailing, this advantage is much appreciated. By concentrating the work of a course into two weeks much more is accomplished than by distributing an equal amount of work through six or eight weeks.

The short courses just finished were more largely attended than

during previous years. While most of the sixty-five students in attendance were from East and Middle Tennessee, yet we are glad to learn that several were from the Western division of the State. Four old students returned and expressed their pleasure in the general growth of the short course work, in both number of students and in the facilities and character of the instruction.

The number of students distributed among the courses was as follows: Agronomy, 19; Animal husbandry, 23; Dairying, 16; Poultry, 3; Bee culture, 7; Domestic science 22, and Horticulture, 10.

The separate course system will be continued in the future and from the experiences of the courses just closed will be strengthened at many points.

Farmers at Experiment Station Farm.

LOCALS AND PERSONALS.

Prof. Bain recently made a trip to a number of points in Middle and West Tennessee, Murfreesboro, Columbia, Nashville, Jackson and Henderson. His object was to learn the prevalence of the new winter clover disease, which is found on the Experiment Station. He discovered slight attacks of this disease in Williamson and Maury Counties, but it is not in serious proportions yet.

Prof. Morgan was in Nashville on business about the middle of the month.

Prof. Keffer was called to the home of his parents in Des Moines, Iowa, March 10, by the sickness of his mother. He returned on the 18, leaving his mother considerably revived.

Early in the month Prof. Essary made a short visit to his home in West Tennesee.

Thos. O. Henley, of Madisonville, Monroe County, has come to the University to take some special work in agriculture.

James Tyler, poultryman, has recently returned to the Experiment Station. He has spent several months at Cornell University, enrolled in the poultry course.

Spring work is rapidly going on at the University Farm now.

Three members of the agricultural faculty are now editing departments for the Industrious Hen: Mr. J. N. Price, dairyman, edits the dairy page; Mr. G. M. Bentley, assistant state entomologist, the bee department, and Dr. M. Jacobs, veterinarian, the veterinary department.

The Biennial Report of the Department of Agriculture for 1905-1906, in its 542 pages, covers the field of agriculture in a very complete and thorough manner. Seven articles in this report are by members of the faculty of the University of Tennessee; two by Prof. Keffer, "Truck Farming in West Tennessee," and "How to Make a Farm Orchard;" one by Miss Anna M. Gilchrist, "The Farm Home;" one by Prof. C. A. Mooers, "Improvement of Worn-out Soils;" two by Prof. S. M. Bain, "Clover Sickness and Its Cause," and "Apple and Pear Blight in Tennessee;" one by Prof. H. A. Morgan, "Agricultural Investigation and Its Interpretation."

The Agricultural and Educational Committees of the General Assembly of Tennessee visited the University and the Experiment Stations February 26 and 27.

No longer can it be said, "Tennessee does not support higher education."

Training pays enormously. It yields big returns in modern agriculture.

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THE U. T. FARMER

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JAPANESE CLOVER.

Lespedeza striata, Hook and Arm, Japan Clover, Japanese Clover, King Grass, Hoopcoop Plant. Order Leguminosae; Sub-order Papilionaceae.

JAPANESE clover is an important forage plant, grown and extensively naturalized in the Southeastern United States. Botanical description: Annual; stems diffusely branched, recumbent, or erect when crowded; 3 in. to 2 ft. or more in height; sub-pubescent; petioles very short; leaflets oblong-obovate, 6 in. long or less; peduncles very short, 1-5 flowered, flowers appearing singly in axils of leaves; corolla purple; pod small, little exceeding the calyx. In the vegetative state the plant is easily confused with Trifolium procumbens (low Hop-clover). They may be readily distinguished when in flower, the Hop-clover producing much smaller yellow flowers in true heads.

Chemical analyses made in Mississippi (Tracy) and Alabama (U. S. Dept.) are as follows:

	Water	Crude protein	Fat	Nitrogen-free extract	Crude Fiber	Ash
	%	%	%	%	%	%
Mississippi	13.99	12.62	2.64	40.76	24.44	5.55
Alabama	9.13	13.70	3.99	47.52	21.55	4.11

The plant is a valuable soil renovator, since it stores up free nitrogen in common with other legumes.

It is grown successfully as far north as Kentucky and Virginia; westward to Arkansas and eastern Texas, and is especially adapted to the Gulf and South Atlantic States. It is especially suited to argillaceous soils, but will succeed in almost any kind of soil. Over many parts of its region it has become thoroughly naturalized. The seed may be sown when all danger of frosts has passed. A stand may also be obtained by scattering the manure of live stock fed on the hay or green forage of Lespedeza containing ripe seed. The same result is obtained by allowing stock the free range of an adjoining field which it is desired to seed.

Japan clover may be used instead of red clover in any system of rotation.

Two other species of Lespedeza (L. bicolor and L. sericea) have been tested by the North Carolina Station. McCarthy (N. C. Bulletin 133) found a large-leaved variety of Japan clover (Lespedeza striata lata) to be superior to the common form.

Besides these species of Lespedeza a number of others occur over most of this country, and contribute largely to the value of the native pastures, especially in thin upland soils not too densely wooded.

For hay Japan clover should be cut before it is over-ripe; a good practice is to mow when about half of the lower crop of seed have matured. This provides for reseeding the next year on the same field or by spreading of manure as above suggested. It will yield on good land 2 to 3 tons of hay per acre. For seed production half-ripe hay may be threshed with loss of one-half value to the hay, or seed may be obtained from siftings of the hay. Hay may be cocked after thorough wilting on same day as cut; one or two days in cocks is sufficient before final storage. It should be handled carefully to prevent loss of leaves.

Japan clover affords valuable pasturage for cattle, horses, hogs or sheep, though they must be accustomed to it in order to relish it. McCarthy considers it the best pasture plant for the poorer clay soils of the cotton region.

With cotton seed as the grain ration, Tracy found Lespedeza to be the cheapest milk-producing ration at the Mississippi Station. Lespedeza is almost devoid of serious enemies in the way of weeds, insects, or parasitic fungi. It combats successfully almost all the weeds, and, according to McCarthy, can eradicate Bermuda grass, broom sedge, and nut-grass. It should, therefore, not be allowed to gain a foothold in permanent grass lands. On the other hand, it causes no trouble as a weed in cultivated lands.

A species of Colletotrichum has been found on Lespedeza in Tennessee, but as yet has caused no serious injury.

The hay commands a ready sale in the market.

Japan clover was accidentally introduced into this country from China or Japan, and was first observed near Charleston, S. C., about the year 1849. From this region it has spread gradually over its present range.

The most important literature bearing on the agricultural aspect of Lespedeza is as follows:

Dodson, W. R., La. Sta. Bulletin 72, 2d ser., 1902. McCarthy, G., N. C. Sta. Bulletin 70, 1890. Tracy, S. M., Miss. Sta. Report 1, 1888; Rep. 3, 1890; Bulletin 20, 1892.

SAMUEL M. BAIN,
Professor of Botany.

HOG HOUSES.

EVERY farmer can provide shelter for a reasonable number of hogs with very little expense. Elaborately designed quarters for hogs are usually undesirable, for unlike other animals, they should not be kept in large numbers under the same shelter. Even where the animals have plenty of room the large houses are objectionable. They are hard to keep clean and well ventilated. At the time of year

when shelter is particularly necessary, such buildings are cool, dull, and admit the sunshine sparingly. Disease is hard enough to control under the best conditions; so one should endeavor to secure these as far as it is possible.

A still greater objection to the large houses is the difficulty in the arrangement of pasture and exercising pens for young, growing pigs. These two points can not be too strongly emphasized by the swine grower.

Of the smaller type the individual house, or pen, is most popular. There are several plans for building these houses, but after much experience with them we think the "Lovejoy Plan"—see cut in "Farm Buildings," page 93—is best for us. In shape it is like an "A" tent and consists of a gabled roof resting on the ground, with the gables boarded in. Viewed from the front it is triangular. After trying several different

Short Course Students Judging Hogs.

sizes we are now building them eight feet in front at base and from seven to eight feet deep. The sides are made by sawing a fourteen foot board in the middle. This makes the apex or top of pen about six feet high.

Material required for building pen with base eight feet square, is as follows: 8 pieces 1x12x14 siding; 4 pieces 1x12x12 ends; 3 pieces 2x4x16 nailing ties; 9 pieces 1x4x14 strips for cracks and bottoms for door and windows. Have a door 36 inches high and 26 inches wide in the east end, and a window 16 inches square in the opposite end. A window may also be placed in the east end. The nailing tie in the front end should be placed flat so that it may offer little interference to heavy sows. We often nail a strip along the cone, but two boards nailed together, as for a hog trough, and inverted on the cone answers admirably. Our pens are not floored, but should they be placed on poorly drained ground, a floor would be necessary. In any event keep the pens well bedded with

clean, dry straw or cut fodder. Where floors are required, build them saparate from the pens. Put battons on underside and let nailing ties in front and behind rest on them. The floor should be cut to fit inside the pen.

This is decidedly the cheapest house we can build. It is an ideal place for sows at farrowing time, as they can be moved from place to place; and for young shoats is equally as good.

To move them, a slide is very useful. Drive alongside the pen, push it over on one side and move to its next location. Oftentimes they are built on runners. One horse can draw them easily.

The Kansas Experiment Station has shown that pigs kept in open yard require 25 per cent more corn for 100 pounds of gain than those given shelter. This trial was conducted during very cold weather, but even with our winters there must be quite a difference in favor of shelter.

EWING HITE.

FERTILIZERS.

THERE is no one question of greater importance to the farmers of this country than that of soil fertility. Careful study has shown that plants take from the soil seven chemical elements which are necessary to plant growth, viz., nitrogen, potassium, phosphorus, magnesium, sulphur, iron and calcium.

The number of substances liable to rapid exhaustion is generally limited to four, which are nitrogen, phosphoric acid, potash and lime. These are liable to be exhausted chiefly, because they are taken up by plants in larger amounts than the others. It has been proven that a deficiency of one element may limit the production of the soil, for one element can not take the place of or perform the function of another. There may be for example, a relative abundance of potash and of phosphoric acid, in the soil, but a great deficiency of nitrogen, in which case good crops of cereals could not be grown, because no other element can take the place of the nitrogen required by the plants.

If all of the crops be taken off the land year after year, it would rapidly lose in fertility, unless the amount of plant food applied equals or exceeds the total amounts removed. A soil generally has an abundance of one or two of the essential elements of plant food, along with a deficiency in others. One way to use fertilizers in a rational manner is to put back on the land, each year, the amount of mineral plant food removed, and to grow legumes for nitrogen. Manure should be carefully saved and spread every year.

Nitrogen is the most expensive fertilizer element, and all things considered, is perhaps the most important. It exists as a constituent of the air and is as necessary to vegetation as carbon, which also exists in the atmosphere and which is taken up by the leaves of plants. All plants do not have the power of acquiring nitrogen from this source, but only

those known as legumes, which take up nitrogen through the assistance of bacteria that live on their roots. In order to obtain a clear conception of the uses of this element as a fertilizer, we must, first of all, understand the peculiarity of legumes as compared with the cereals and grasses that need nitrogen in the soil as truly as they need lime, phosphoric acid, etc.

It is a well known fact that different crops need different quantities of the various essential elements. If we know, with a fair degree of certainty, how much each crop takes from the soil, we have a guide to the amount of the different elements of plant food to apply.

A ton of timothy hay contains 25 pounds of nitrogen, 18 pounds of potash, and 10 pounds phosphoric acid, all of which must come from the soil. A ton of pea hay contains 40 pounds of nitrogen, 30 pounds of potash and 10 pounds of phosphoric acid; of which only the latter two need be supplied by the soil. The manure from a ton of timothy hay might return, if well cared for, three-fourths of the nitrogen originally in the hay that came from the soil. In the case of peas, however, the nitrogen in the manure should more than replace the amount taken from the soil, for in this case it receives not only what it gave, but about thirty pounds of nitrogen in addition. Nitrogen forms but two to three per cent of the weight of common plants, but it is absolutely necessary to their growth.

Cotton seed meal is one of the best of the nitrogenous fertilizing materials. It is fairly concentrated, containing about seven per cent of nitrogen, and decays rapidly in the soil. It is used in large quantities, particularly in the southern states.

Lime is very much needed on most soils, and is especially valuable for clovers. It produces marked effect on all leguminous crops. Forty or fifty bushels, once in five years, is a moderate application. Potash strengthens the stems and woody fiber of plants; it gives firmness, color and keeping quality to the fruits, favors the production of healthy fruit buds and is of great importance in the formation of starch in plants.

Home mixing of fertilizers is one of the best practices for farmers. They can then know what they have. The mixing can be done for fifty cents per ton, but if the fertilizer is bought ready mixed, it will cost him three to four dollars more per ton, without any corresponding increase in efficiency. A good mixture for potatoes is 200 pounds of acid phosphate, 50 pounds of muriate of potash, 350 pounds of cottonseed meal; 500 to 1,000 pounds per acre may be used. For wheat use 200 pounds of acid phosphate and 25 pounds of muriate of potash per acre in the fall, and in the spring top-dress with 50 pounds of nitrate of soda.

Steamed bone meal is a good fertilizer for wheat. Use from 200 to 400 pounds per acre.

Three to five hundred pounds per acre of a fertilizer analyzing 8 per cent phosphoric acid and 4 per cent potash is a good application for legumes.

G. A. KOGER, Short Court, '07.

SUPPRESSION OF TUBERCULOSIS.

FOR the past twenty-five years the interest in the control and suppression of consumption has constantly increased and seems just now to have reached a climax. In the United States the work has taken the form of legislative acts, which are calculated to ascertain the prevalence of the disease and to assist boards of health and prophylactic organizations in eradicating this malady, which claims more victims than any other human ill. Most of the states have more or less definite laws pertaining to the matter, and some are very strict concerning their enforcement.

The methods of procedure against the disease throughout Europe and America are practically all based upon the experiments and observations of Robert Koch, and his views have in the main been accepted as final, until quite recently. In fact, Koch's discovery of the bacillus which is undoubtedly the cause of tissue degeneration in consumption, and of tuberculin as a ready means of detecting the presence of the germ in the organism, mark an epoch in the study of the disease.

Koch's methods of combat are, of course, in harmony with his understanding of the means by which the germ is disseminated and its mode of gaining entrance to the internal organs of the body. He considers the spread of the bacteria as due, in the largest measure, to careless disposition of tuberculous sputum of persons suffering from an attack of the disease. This matter becomes dry, is taken up by the wind and carried considerable distances and in various directions; so that any one coming in contact with the contaminated air breathes the germ into the nose and mouth, and from there they easily gain access to the tissues of the lungs where the disturbance is quickly set up.

Now, if this be the chief means of spreading the germs, it is easy to see that consumption may be readily stamped out by the observance of strict hygienic care of those suffering from the malady.

As has been stated, these views have been largely accepted and concerted action has been guided by them.

The views of Koch, however, are now brought into serious question by the very recent investigations of Prof. E. Van Behring, and must stand or fall according to results of future research and experiment.

Behring's observations have convinced him that the tubercle bacilli rarely, if ever, enter the body with the air we breath, and, if by chance they should do so, they can not by any possible means go directly to the lung, but must pass down the digestive tract and be absorbed from there into the lymphatic system; thence with the blood stream enter the organs which are susceptable to their activity. While Behring does not discourage sanitary precaution in regard to the effete matter from consumptives, he regards it as of secondary importance, but says that the real and essential effort should be directed toward the freeing of food from con-

tamination, and especially the milk of infancy. Childhood is the danger period of susceptibility. Adult life is practically free from infection.

It is well known that the germ may enter the body and by certain resistant activity of the product of metabolism become surrounded or encysted and thus prevented from migrating to other tissues or causing any damage to those in immediate contact. When proper conditions arise, however, it may destroy the confining tissues and spread freely throughout the body. In some such way Behring thinks that the germs enter during infancy and remain dormant until favorable conditions arise. Behring claims that while Koch's tuberculin invariably indicates that the germs are or have been present in the tissues, it in no way proves that sooner or later the sufferer must succumb to consumption.

According to this author the whole secret of success lies in ridding our food of the dangerous bacilli, and particularly the milk of infancy, whether supplied by tuberculous mothers or from tuberculous cows; and this is to be accomplished by making the person immune to the disease. He claims that such immunity is transmissible to the offspring.

The first successful effort in the production of immunity from this disease in animals, was about eight years ago, and consisted in inoculating cows with weak, though virulent, human bacilli. According to Koch's idea the human bacillus is different from the bovine; this Behring thinks is not the case, but that the germ has merely lost virulence by passing through the human body. Behring has lately introduced a method of immunizing, which he calls mithreditizing, that is being practiced with marked success and promises to render valuable service in the eradication of the disease.

Still later, in fact within the last few months, the same author has announced the discovery of a substance which he calls tulaselactine, for which he claims great efficiency in the production of immunity. He also thinks that this substance may be used to great advantage in the treatment of patients who have been infected with the tubercle germ, if they have not already become phthisic.

Cows whose milk contains the germ, rabbits with tuberculosis of the eye and Guinea pigs with chronic consumption have been successfully treated by the tulase method. As yet no human subject has been treated, but Behring is confident the results would be highly satisfactory.

Since Behring is a recognized authority, his work at once commands attention and is calculated to call into action a host of workers who will no doubt do much toward solving this serious and complex problem.

There is certainly much yet to be learned about the control of this disease.

MAURICE MULVANIA,
Assistant in Bacteriology.

MAY 22, 23 AND 24.

THE STOMACH WORM (HOEMONCHUS CONTORTUS) IN SHEEP.

THE stomach worm of sheep (Hoemonchus contortus) is generally recognized as one of the most serious pests with which the sheep raiser has to contend. Sheep of all ages are subject to infection. The most serious effects of the stomach worm infection are seen in lambs; full grown sheep, although heavily infested, may show no apparent symptoms of the disease. It is from the mature sheep, however, through the medium of the pasture, that the lambs become infected.

Among the symptoms which have been described for stomach worm disease, probably the most frequent are anemia, loss of flesh, general weakness, dullness, capricious appetite, thirst, and diarrhea. The anemic condition is seen in the paleness of the skin and mucous membranes of

the mouth and eyes, and in the watery swellings which often develop under the lower jaw. A more certain diagnosis may be made by killing one of the flock and opening the fourth stomach. The contents of the fourth stomach are allowed to settle gently, and by carefully watching the liquid the worms, if present in any considerable numbers, may be seen actively wriggling about like snakes. They are from one-half to one and one-fourth inches long and about as thick as an ordinary pin.

The worms in the stomach produce eggs of microscopic size, which pass out of the body in the droppings and are thus scattered broadcast

over the pasture. If the temperature is above 40° to 50° F., the eggs hatch out, requiring from a few hours to two weeks, according as the temperature is high or low. If the temperature should be below 40° F. at the time the foetus passes from the body, the eggs remain dormant, and in this condition may retain their vitality for two or three months. Afterwards they will hatch, if the weather becomes warmer. Freezing or drying soon kills the unhatched eggs. The tiny worm which hatches from the egg feeds upon the organic matter in the manure, and grows until it is nearly 1-30 of an inch in length. Further development then ceases until the worm is swallowed by a sheep or other ruminant, after which it again begins to grow and reaches maturity in the fourth stomach of its host in two or three weeks. The chances of the young worms being swallowed, are greatly increased by the fact that they crawl upon blades of grass whenever sufficient moisture—such as dew, rain, or fog—is present; provided, also, that the temperature is above 40° F. When the temperature is below 40° F. the worms are inactive.

Fortunately, the loss caused by the stomach worm can be almost entirely prevented. It is necessary for the flock owner to become familiar with the trouble and apply the proper remedies at the right time. The measures to be employed are both preventive and curative. Prevention is, of course, the more important. In starting a flock it is advisable, if possible, to procure breeding animals from uninfected flocks. This precaution should always be taken in adding new animals to a flock. Serious infection may, to a great extent, be avoided by changing the pasture yearly and separating the lambs from the old sheep as early as it can be done. Drinking from stagnant pools should not be allowed. Water from deep wells or fresh streams is always preferable.

If symptoms of this parasite should appear in the flock, remedial measures should be taken at once, so that the disease may be checked and infection of the whole flock may be prevented.

The bulletins of the Bureau of Animal Husbandry of the United States Department of Agriculture, from which this paper is compiled, recommend the following remedies which may be used to remove stomach worms: Coaltar creosote, bluestone, and gasoline.

The animals to be treated should be deprived of feed for twelve to sixteen, or even twenty-four hours, before they are dosed, and, in case bluestone is used, should receive no water on the day they are treated, either before or after dosing. In drenching, a long-necked bottle or a drenching tube may be used.

In dosing the animal great care should be used not only to avoid the entrance of the liquid into the lungs, but also in the preparation and administration of the remedy, so that the solution may not be too strong or the dose too large. If the animal is left standing on all fours and the nose raised no higher than the level of the eyes the liquid will pass immediately to the fourth stomach.

REMEDIES.

Coaltar Creosote.

Good results have been obtained from a single dose of a one per cent solution of coaltar creosote. This solution is made by shaking together 1 ounce of coaltar creosote and 99 ounces of water. The dose of this one per cent mixture, recommended by Stiles, are as follows:

Lambs, 4 to 12 months old ..... 2 to 4 ounces.
Yearling sheep and above ..... 3 to 5 ounces.

Serious objections to the use of coaltar creosote have been found, in that the substance known by this name varies considerably in composition, and in that some trouble is often experienced in obtaining it in many parts of the country.

Bluestone.

Bluestone, or copper sulphate, is highly recommended by the colonial veterinary surgeon of Cape Colony as the best and safest remedy. This solution is made by mixing together thoroughly 1 pound,avoirdupois, of pure bluestone and 9½ gallons of warm water. This solution is given in the following sized doses:

Lambs, 3 months old ..... ¾ ounce.
Lambs, 6 months old ..... 1½ ounces.
Sheep 12 months old ..... 2½ ounces.
Sheep 18 months old ..... 3 ounces.
Sheep 24 months old ..... 3½ ounces.

Gasoline.

Gasoline is one of the most popular remedies for stomach worms that has been used in this country. It has the particular advantage of being readily obtained. It is important to repeat the dose, if the gasoline treatment is employed, and it is usual to administer the treatment on three successive days, as follows:

The evening before the first treatment is to be given the animals are shut up without feed or water and are dosed about 10 o'clock the next morning. Three hours later they are allowed feed and water; and at night they are again shut up without feed or water. The next morning the second dose is given; and the third morning the third dose. The treatment before and after dosing is the same in each case.

The sizes of the doses are as follows:

Lambs ..... ¼ ounce.
Sheep ..... ½ ounce.

The dose for each animal is measured and mixed separately in linseed oil, milk, or flaxseed tea, and administered by means of a bottle or drenching tube. Gasoline should not be given in water.

ALBERT T. ANDERS.

IT WILL PAY TO QUIT WORK AND BRING YOUR FAMILY TO THE FARMERS' CONVENTION.

ROTATION OF CROPS.

THE rotation of farm crops is assuming a position of increasingly great importance in American agriculture, and is now the established practice where the best farming is done. The reasons for adopting a system of crop rotation, instead of following the one crop system, are numerous and significant. The food requirements of the various kinds of plants differ widely, so that by rotating crops a more uniform utilization of the elements of plant foods is attained. Potatoes and grasses require large amounts of nitrogen and potash, while onions draw heavily on phosphoric acid, in addition to using large amounts of the former two substances. Some plants are ranker feeders than others, so will succeed in soil too poor for the average farm crops. Buckwheat and rye will make good growths where corn or potatoes would be comparative failures.

The depths to which plant roots go in the soil vary greatly with the different species, so that by rotating crops, plant food from the subsoil and surface soil may be more equally used. The cabbage family, root crops, alfalfa, and clover are notably deep feeders, drawing the elements of plant food from depths of soil out of the reach of the shallower rooted plants. On the other hand, the cereals, grasses, strawberries, melons, etc., are shallow feeding plants; so they tend to rapidly exhaust the surface soil, if continuously grown on the same land. Peas, beans and potatoes may be classed among those that send their roots only to a moderate depth. From what has been said it is apparent that the practice of alternating deep feeding with shallow feeding crops is theoretically a good one, and experience confirms the theory.

By including a leguminous crop in the rotation, the farmer may avoid buying much, if any, nitrogenous fertilizers. As this element is several times as expensive as any other necessary element of plant food, the importance of growing legumes is very readily appreciated.

The system of rotating the crop affords a check on plant diseases and insect attacks. Diseases of plants are caused primarily by the growth on them of some parasitic fungi. These fungi are very small, microscopic in dimensions, plants that reproduce by spores and by branching of the vegetative parts. Moreover, the different species of plants are infested by different species of fungi, so that, if the host plant be omitted from the rotation, the former will not live on the following crop and will thus largely perish unless there is another closely related species near.

In a general way the same principle applies to insects that infest farm crops. Many of them spread rapidly, while others are very sluggish and do not move far from their place of hibernation. So where the one crop system is followed, they steadily increase, but, if the food plant of a certain species of insect is omitted for a year or two, they are likely to die, because their diet is limited to a comparatively small number of kinds of host plants. This fact is very noticeable in regard to the Colo-

rado potato beetle; when potatoes follow potatoes the beetles become increasingly numerous, but when the crop follows clover or grass, they usually give but little trouble.

What has been said about fungi and insects in a general way, applies to weeds. The different farm crops usually have particular weeds that are much worse than others; so that where one crop is continuously grown the weed that is common to that crop is likely to become very plentiful. Some crops, on account of the careful tillage that must be given them or due to their rank growth, offer much better opportunities for eradicating weeds. Corn is very hard to keep free from weeds, while sorghum and rape smother them to a great extent. Thus by a wise rotation of crops, clean culture is made easier and a purer product may be harvested.

Another reason for the rotation of crops is that labor is more equally distributed throughout the year than in case the one crop system is followed. The exclusive wheat grower needs a large number of hands at seeding time and a still larger number at harvest and threshing time, but during the rest of the year a very few are needed. So a bigger price must be paid the extra help and there is danger that they can not be obtained at all. But where intelligent rotation of crops is combined with stock farming, about the same number of hands are needed throughout the year.

A disastrous failure is much less likely to occur where a large variety of crops are grown. A drouth that ruins the corn crop may not injure the wheat and may only slightly injure sorghum and cow peas.

Finally, by rotating crops a better ration may be obtained for the live stock. The exclusive corn grower can not place before his stock a balanced ration unless he buys some additional feed. On the other hand the farmer who grows corn, clover, grass, oats, barley, peas and beans, can, independently of feed stores, place before his stock a ration that can not be excelled for meat or milk production, or for net profit.

From what has been said it is evident, theoretically and practically, that a rotation should include a deep-rooted crop, a shallow feeding crop, a crop or crops that extracts nitrogen from the air, and a cleansing crop. Also some attention might well be given to alternating crops, for which phosphoric acid is the leading element, with those for which potash is the leading element.

Below are given some rotations that fulfill the above requirements, in most cases, and are being successfully used.

The Norfolk rotation is a four-course system that is used extensively in England and in a modified form in this country. The crops used and the order in which they are placed are as follows: Turnips, barley, clover and wheat, each for one year. The turnips are deep and rank feeders, and make a cleansing crop. They are especially benefited by the application of potash. The barley is a shallow rooted crop that requires a large amount of nitrogen. The clover extracts its nitrogen from the air and

can appropriate the phosphoric acid and potash of the deeper parts of the soil. The wheat completing the rotation is a shallow feeding crop that is especially benefited by the nitrogen stored by the clover, and by the good mechanical condition of the soil as left by the clover roots. This rotation may be modified in many ways to suit conditions. Sugar beets, cabbage, rape or rutabagas may be substituted for the turnips; oats for the barley; clover and grass for the clover, and allowed to stand for two or three years, thus making a five or six year rotation; and rye may be substituted for the wheat.

A rotation used by cotton growers, is as follows: Corn and cow peas one year; oats, followed by cow peas, the same year, and cotton. This is a four-course rotation completed in three years. This rotation should maintain the nitrogen supply of the soil, if the legumes are properly handled, but is open to the criticism of having no winter cover crop.

A two-course system completed in one year, consists of cow peas, followed by wheat. The cow peas should be sowed in the latter part of June or the first of July and turned under about a month before seeding time, or pastured off. The cow peas are rank feeders and nitrogen formers, while the wheat prevents the loss of plant food by leaching through the winter months.

Where potatoes are grown extensively the following system of crop rotation is sometimes used: Potatoes, followed by crimson clover. This rotation is completed in one year, and two crops are produced. Also the nitrogen supply of the soil is maintained. But where this system is used blights and beetles are more numerous than where a rotation extending over a period of several years is adopted.

A two year rotation that minimizes labor, maintains the fertility of the soil and is a financial success with many farmers, consists of corn and cow peas, rye and alsike clover. The corn and cow peas, which are grown together, are pastured off by hogs, when the crops are in the proper condition. A heavy seeding of rye is made (broadcast) in November, and is left to be tramped in by the hogs and covered by rains. The alsike clover is sowed in February. The rye is pastured off with hogs when the grain is formed, and the clover is pastured during the summer and autumn. This system has in it much to be recommended and much to be condemned. The two legumes, cow peas and alsike clover, maintain the nitrogen supply of the soil; the land is never without a cover crop, so there is little likeli-hood of plant food being lost by leaching; all of the crops are fed on the soil, so that only the small per cent that leaves as meat or bone is removed from the field; and labor is reduced to a minimum, the hogs do the work. On the other hand much of the grain, corn, rye and peas, and a very large part of the roughage, corn and pea stover, and rye straw, are wasted, so that valuable feed is lost; if the crop were harvested and fed by the farmer, a more economical, balanced ration could be made; the tramping of the land, when wet,

has an injurious effect on it, and the exposure of the hogs to the cold rains of fall and winter is a bad practice.

The following rotation is a very good one for the dairy farmer: Corn and cow peas, rye and crimson clover, sorghum and cow peas, wheat, alsike clover and grass. The corn and cow peas may be cut for silage. The rye and crimson clover should be sowed in August; they may be sowed among the standing corn and covered by using a fine tooth one-horse cultivator. However, if the corn and cow peas can be cut very early, a more satisfactory sowing may be made after the standing crop is removed. The rye and crimson clover may be pastured off in the spring, and turned under in time to plant the sorghum and cow peas. The sorghum and cow peas should be used for silage. The wheat and grass are sowed in the fall, and the alsike clover in the latter part of the winter. The clover and grass may be pastured or cut for hay, and may be allowed to stand for two or three years. This rotation is completed in three, four or five years, accordingly as one, two or three crops of clover and grass are taken. It is an excellent system, embracing legumes, deep and shallow rooted crops, winter as well as summer crops, and the land is kept "busy" all the time.

A short rotation that is considerably used where corn is grown every year consists of corn, followed by rye and crimson clover. The rye and crimson clover may be sowed as was suggested in the last rotation mentioned above. They may be pastured in the spring until the land must be plowed for the next corn crop. The pasture afforded more than pays for the extra labor expended and for the seed. Moreover, far better crops of corn are produced.

L. R. NEEL, '07.

REMEMBER THE FARMERS' CONVENTION AT KNOXVILLE, MAY 22, 23 AND 24.

SPRAYING WITH BORDEAUX.

Digest from the New York Agricultural Experiment Station Report, 1905.

IN 1902 the New York Agricultural Experiment Station began a number of yearly experiments in spraying potatoes with Bordeaux mixture. These experiments are to cover a period of ten years and are designed to determine how much the yield of potatoes can be increased, on the average, by spraying with this mixture.

During the year 1905 the station carried on two experiments, one at Geneva, the other at Riverhead. In addition to these there were fourteen farmers' business experiments and forty-one farmers' volunteer experiments carried on under the supervision of the station. These were well scattered over the state.

The enemies combatted are the flea-beetle, early blight, caused by the parasitic fungus, Alternaria solani, and late blight, caused by the parasitic fungus, Phytophthora infestans. The last mentioned has been the chief enemy in most cases.

In making the mixture, in every case, the following formula was used: Make a stock solution of copper sulphate by dissolving 100 pounds in 50 gallons of water, or in like proportions; make a stock solution of slacked lime. In the preparation of the mixture 3 gallons of the stock solution of copper sulphate is poured into 50 gallons of water. Into this dilute milk of lime is poured through a strainer until the mixture will "stand the test." The "test" is made by adding a few drops of a solution of yellow prussiate of potash. If more lime is needed, the test solution turns reddish brown as soon as it comes in contact with the mixture. In such case milk of lime is added until the brown color ceases to appear when the prussiate of potash is applied. Paris green or arsenite of soda is then added to prevent injury from the Colorado beetle.

The average cost of spraying per acre was about $4.00, but, of course, varied according to the number of applications. This included cost of making the mixture, cost of labor in spraying and a liberal amount for wear on machine used.

The sprayers used were of every type from the small compressed air sprayer to the geared pump machine drawn by horse power. The type of sprayer of course depended on the acreage.

The experiments are made by leaving unsprayed certain rows in different parts of the field, and when the potatoes are dug comparisons of the yields of these with sprayed rows are made. Paris green or arsenite of soda is applied to the unsprayed rows in the same quantities as to the sprayed rows, so that the Colorado beetle can not affect the results.

In those experiments that were most successful, spraying was begun when the plants were from six to eight inches in height and repeated every ten or fourteen days.

The results of these experiments seem almost incredible. Even in some cases in which neither blights nor flea-beetles attacked the unsprayed rows, the sprayed rows outyielded the former. So the mixture is not only useful in preventing injury from insect and fungus attacks, but also it has a stimulating effect on plants. In all cases the life of the sprayed rows was prolonged—in some instances as much as thirty days. But in the yield, and that is the most important consideration, the results were yet more remarkable. At Geneva in 1905 five sprayings increased the yield 233 bushels per acre, while three sprayings increased it 191. In the fourteen farmers' business experiments, including 180 acres, the average gain due to spraying was 62 bushels per acre. In the farmers' volunteer experiments, including 363 acres, the average gain was 58 bushels per acre. Not only was the quantity of tubers increased but also, in every case, a larger per cent of them were marketable. Another important result was the effect on the table qualities of the potato as shown by the cooking test. In every instance cooked tubers from the sprayed rows were more mealy than those from the unsprayed rows. In fact, in every possible way the crop seems to be benefited by the use of Bordeaux mixture.

Doubtless Tennessee potato growers would find it very profitable to use Bordeaux mixture extensively. W. M. LANDESS, '10.

REMEMBER THE FARMERS' CONVENTION AT KNOXVILLE, MAY 22, 23 AND 24.

EDITORIAL.

THE FARMERS' CONVENTION.

The thirty-second annual session of the East Tennessee Farmers' Convention and institute to be held on the University campus, May 22, 23 and 24, is an event that the farmers can not afford to miss. Through nearly a third of a century this organization has served a useful purpose in the eastern part of the state, and the session this year bids fair to be one of the best, if not the best, ever held. Every phase of farm life will be presented and discussed by able speakers. Dairy problems, beef production, mule growing, hog and poultry raising, soil fertility, road making, agricultural education and the farm home, will all be discussed by experts of the various subjects.

It is hoped and expected that the following persons, as well as many others, will be here to talk to the convention: Governor Patterson; Commissioner-elect, Col. John Thompson; R. L. Jones, State Superintendent of Public Schools; Alva Agee; W. J. Spillman, Department of Agriculture; Prof. M. A. Scovell, of Kentucky; D. W. King, and Mrs. Reagan, of Sweetwater, and Miss Gilchrist, of the University.

The U. T. Farmer would be glad to see the 1,500 members return that were here last year, and hopes that many others may come also. It will endeavor to make the farmers' stay here as pleasant as possible.

THE STATE FAIR.

Now, and not the week before it is held, is the time for the farmers to decide what exhibits they are going to make at the State Fair next fall. The lack of competition, in many departments, at the Fair last fall, was very noticeable, and should not be permitted to occur again.

For the most part, prizes in the Agricultural Building were entirely too easily won. Exhibits of fruit, vegetables, grains and grasses that could have been duplicated on hundreds of Tennessee farms and could have been completely out-classed, if farmers had begun to plan for their exhibits last spring, were graced with ribbons. There was but one individual and one county exhibit, though liberal prizes were offered in both cases. However, it is not likely that prizes on agricultural products will be so easily taken next fall, and Tennessee does not want them to be.

By thinning and spraying the fruit now (where the frost has not killed it) very much better specimens may be obtained for exhibition, not to mention better fruit for home use and the market.

By giving the cultivated crops, the small grains and grasses special attention much more nearly perfect exhibits can be made at the Fair. Finally, live stock that is to be prepared for the Fair must not be neglected until a week before hand.

MAY 22, 23 AND 24.

LOCALS AND PERSONALS.

Mr. Cotton has returned from a pleasant week's visit at his home in Elyria, Ohio.

Prof. Morgan has recently returned from a business trip to Nashville. Owing to a wreck he was hindered from attending the Educational Convention held at Pinehurst, N. C.

A few weeks ago Prof. Bain left for Clarendon, Arkansas, where he will continue his experimental work with cotton.

S. S. Smith, Short Course, '06, Whitesburg, Tennessee, has recently returned from an extensive tour of the Middle West. He attended the International Fat Stock Show, at Chicago, and then spent several months in traveling. His trip was a very pleasant and profitable one, and he brought back several thoroughbred Percheron horses, both stallions and mares.

About the middle of the month Profs. Morgan and Mooers and Mr. Converse were in Middle Tennessee in the interest of the co-operative experiment work, made possible by the recent appropriation of the legislature.

The Executive Committee of the East Tennessee Farmers' Convention, Capt. J. N. Ayres, Harriman; Mr. W. Gettys, Athens; Dr. G. T. Mellen, Knoxville; and Mr. W. G. Lenoir, Philadelphia, were at the University lately, to make up the program for the convention. Mr. W. W. Ogilvie, was to have been present but was prevented by sickness of his family.

The April freezes were disastrous to fruit on the University Fruit Farm. All of the peaches seem to be killed. The plums, with the exception of some of the Wild Goose variety, all of the pears and a large part of the apples have suffered the same fate. The strawberry crop is reduced about one-half (about half of the bloom had appeared).

Wheat, at the Experiment Station, was not injured by the freeze. But the corn and soja beans, that had been planted, were killed.

REMEMBER THE FARMERS' CONVENTION AT KNOXVILLE, MAY 22, 23 AND 24.

Visitors at the University Farm, During E. T. Farmers' Convention.

CONTENTS—MAY, 1907

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DRIVE ON UNIVERSITY CAMPUS

Courtesy of '07 Volunteer

THE U. T. FARMER

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DISEASES OF DOMESTIC ANIMALS COMMUNICABLE TO MAN.

THERE is probably no phase of comparative medicine which during the last few years has received more consideration by the pathologist than the question of the communicability of diseases from animals to man. The progress of sanitary science depends largely upon this same question, for as our knowledge of medical and veterinary science becomes more thorough, prophylaxis is becoming the most important factor in coping with the various infectious and parasitic diseases. But in order to be able to outline substantial prophylactic measures, they should be based upon scientific facts, i. e., the etiology and pathology of the disease should be understood. As we become more and more enlightened upon these points, we notice a closer relationship between the diseases affecting animals and those of man, and the transmission from one to the other has made itself in many instances painfully evident. To discuss each disease in detail which may be directly or indirectly transmitted from animal to man, would occupy more space than could be allotted to me at this time.

I will refer, however, to the more common diseases and conditions in which you, as agriculturalists, are more or less concerned. It is true, there are some people who are rather skeptical as to such a transmission of disease, but their views in such instances are based upon ignorance rather than scientific proof. If we bear in mind that the histological structures and the physiological mechanisms of the vital tissues are almost identical we must come to the conclusion that there is a relation in disease as well as in health. But we must remember that every disease of animals is not necessarily common to man, e. g., Black leg is a prevalent infectious disease among cattle, to which man, on the other hand, under ordinary conditions, is immune.

Some of the common infectious diseases which may be directly or indirectly transmitted from animals to man, are the following: Tuberculosis, rabies, anthrax, glanders, variola and aphthous fever (foot and mouth disease). Of these tuberculosis is by far the most common and comes very near being a panzaotic disease, while under ordinary conditions some animals, such as reptiles, fishes, birds and some mammals do not readily contract this disease, yet under abnormal and debilitating conditions, they will readily succumb to it. The horse, ass and mule rarely contract the disease casually, but are readily susceptible to inoculation.

Dogs and cats occasionally contract tuberculosis, which is generally of human origin, due to the ingestion of sputum from consumptives, or eating food which was contaminated by such people. Avian tuberculosis, or the form found in ordinary barnyard fowl, is a somewhat different variety from that found in mammals, yet under certain conditions they are interchangeable, which I dare say is a strong point in favor of the unicity of the tubercle bacillus.

In sheep and goats, under ordinary conditions, tuberculosis is comparatively rare.

Apes and monkeys, in confinement, die of tuberculosis to the extent of from 95 to 98 per cent. Swine are very susceptible and casually contract the disease from infected cow's milk. It is not an uncommon occurrence to find tuberculous swine in conjunction with a tuberculous herd of cattle. Next to man, in the degree of susceptibility comes the bovine species, in which case it is most extensively found amongst the dairy types of cattle.

Now the relation of this disease in the food producing animals to man, is the point in which we are especially interested. From our present knowledge we are compelled to admit that tuberculosis is transmissable from animals to man; in other words the tubercle bacilli, whether of human or bovine origin are similar. It is true there is a slight morphological difference in this organism when obtained from different sources, but that can be satisfactorily explained when we take into consideration that the tubercle bacillus can adopt itself to circumstances, or in other words, adapt itself to the condition of its host. I am fully aware that this point was strongly disputed by the eminent Dr. Robert Koch a few years ago, at the International Tuberculosis congress, but he was at once bitterly attacked by noted scientists from all over the world, and it is interesting to note that Koch has since then admitted that he spoke too soon. The greatest danger lies in the use of meat and milk from tuberculous animals, and I will cite a few cases to emphasize that fact.

Mr. Howe, of North Hadley, Mass., lost a son, aged 20 months, from abdominal tuberculosis three months after he had paid a week's visit to his uncle and had been fed the milk of his uncle's cow. The cow, upon post mortem examination, showed generalized tuberculosis. The parents were both very robust and the child had previously been healthy.

The four-year-old son of Col. Beecher, of Yonkers, N. Y., died in March, 1894, of tubercular meningitis, and the two cows which had supplied him with milk, were then proven to be consumptive, both by the tuberculin test and post mortem examination.

A case coming under my personal observation occurred in Philadelphia a few years ago, in a noted bacteriologist. He was holding a post mortem examination on a goat which had succumbed to the experimental inoculation with the tubercle bacilli of human origin. He accidently pricked his finger on a splintered rib; he gave it ordinary attention at the time. In four or five weeks a distinct nodule made its appearance

which gradually became larger. It was subsequently excised by Dr. Frazier and cultures and sections were made from the nodule. The cultures showed healthy growing colonies of the tubercle bacillus and the sections were characteristic of a tubercular lesion.

Osler says the post mortem wart (tuberculosis verucosacutis) which is so familiar to the surgeon, as occurring in butchers and tanners, he has every reason to believe is in many instances of bovine origin. I could cite many more cases, but I think the foregoing will be sufficient to show that tuberculosis can be transmitted from animals to man. Direct inoculation has proven that animals can be successfully infected with the tubercle bacillus of human origin.

Rabies (hydrophobia) is another highly dreaded infectious disease which can be transmitted to all warm blooded animals and man. It is most frequently seen in the canine and feline races. In this country this disease is spread almost invariably by the bite of rabid dogs, being readily transmitted in this manner to other animals and man. The microorganism of rabies has as yet not been isolated, but it is known that the infective principle is contained in the saliva and nerve substance—the former, under ordinary conditions, remaining virulent for twenty-four hours and the latter for about fourteen days. Here again we have many cases on record where this disease has been communicated to man through the bite of an animal so afflicted. It differs from many other diseases in so far that rabies is almost invariably fatal, if the true clinical symptoms have once developed. Therefore the dread which is generally held against this disease is, to a certain extent, well founded. However, the prophylaxis in relation to rabies has been materially simplified since the discovery by Pasteur of a preventive inoculation, which consists in immunizing the system by the injection of an attenuated virus, the virulence of which is gradually increased until the system is fully able to resist the disease. There are, at present, several institutions in this country, where the treatment can be taken according to the Pasteur method.

Anthrax is another highly fatal, acute infectious disease, due to the anthrax bacillus. Nearly all animals are more or less susceptible. White rats and birds are said to be insusceptible under ordinary conditions, yet if the internal temperature of birds is reduced by cold water immersions or the administration of antipyrine they can be readily infected. One breed of sheep, namely Algerian sheep, are immune to this disease. Man is susceptible to this disease and has quite frequently made such an appearance especially in anthrax localities, amongst people who are compelled to come in contact with anthrax carcasses or their products, such as butchers, tanners, veterinarians, etc. The products of anthrax carcasses, such as hides, hair, bones, etc., have frequently been the means of conveying the virus for thousands of miles with subsequent deleterious effects, both in man and animals. An instance of this kind occurred a few years ago near a tannery at Proctor, Pa., as the result of infected hides which had been shipped from China—several people and animals losing their

lives. Man becomes infected either by inoculation through skin abrasions, inhalation or ingestion. It has, however, a strong tendency to remain localized in man, producing upon inoculation what is known as malignant pustule (carbuncle). Upon ingestion it produces intestinal anthrax and upon inhalation a pulminary form, which as a result of its frequent appearance in people employed in assorting wool, is usually referred to as wool sorter's disease. The cutaneous form generally responds quite readily to surgical treatment, but the pulmonary and intestinal forms are quite fatal. In localities where this disease appears, its danger to man and animals should always be made public.

Glanders is an infectious disease peculiar to solipeds, namely, horses, asses and mules. It is also very important, for its transmission to man has frequently occurred. The infection in man usually occurs directly or indirectly from the horse, yet some cases have resulted from the handling of towels, blankets, sponges, etc., which have become contaminated by the nasal discharge from the horse; the nasal discharge in typical cases is a marked symptom; like anthrax it may be referred to as an industrial disease, being most frequently found in those who come in contact with horses or their wearing apparel. The infection in man generally results from direct contact on wounds, abrasions, etc., with bacillus mollei which is contained in the glanderous discharges. One of the most frequent methods is by picking or handling your nose, when the fingers have been contaminated. I am strongly under the impression that many cases which have been diagnosed as some other affection in man were in reality glanders. In view of the fact that this disease is highly contagious, both to man and solipeds, and also a very fatal disease, it has resulted in the enforcement in many localities of strict sanitary regulations against this disease.

Aphthous fever (foot and mouth disease) is a disease which at present is not of so very much importance to us, since its complete eradication from the United States, even though we had an extensive outbreak during the winter of 1902-03 throughout the New England States. It is an infectious disease to which nearly all animals are susceptible, but is most common amongst ruminants. Its detriment to the human race occurs most frequently in children who drink milk from animals affected with this disease, although adults occasionally, who handle the diseased animals, quite often become infected. Several instances were recorded during our recent outbreak where it had made its appearance in families which were being supplied with milk from infected herds. In man it is not such a serious disease as in the lower animals, but it is an important disease from a sanitary standpoint.

Variola is a disease which is found in all domestic animals, however the disease differs somewhat in the various animals, so far as it is an etiological factor is concerned.

Horse pox (variola equina) and cow pox (variola vaccinae) are supposed to be due to the same organism. It is not a very serious disease in

these animals. The latter is of special importance as it is utilized in producing immunity in man against small-pox.

Sheep-pox is a highly contagious disease amongst sheep, and is prevalent in parts of Europe and Asia. It differs from the other forms of variola in its actual cause.

Dogs contract variola and is either of human or bovine origin and since sheep-pox does not appear in this country we must therefore always suspect infection from small-pox, when variola appears in the dog, and under such circumstances the dog may be the means of spreading the disease. It is therefore of considerable importance that such possible means of contamination should be properly disposed of.

As I have already stated, there are numerous parasitic diseases affecting animals which may be readily transmitted to man; of the less serious I may refer to the various skin diseases, such as favus, ringworm, mange, etc., which, so far as I am able to learn, readily respond to the usual methods of treatment as is the case in animals. There are other parasitic diseases and conditions, however, as found in man which are much more serious and therefore of more importance; I allude here to such conditions as are produced by the consumption of infested meats. I will limit myself here to three, viz.: Trichinosis, taenia solium, taenia saginata. Of these the trichnia spiralis is the most serious, which is produced in man by eating pork which contains the cystic stage of the trichnia spiralis. In view of its supposed prevalence in American pork, several European countries have seen fit to exclude our pork entirely, especially Germany. Those countries which do admit it, do so only upon thorough inspection, consisting of a microscopic examination of muscle tissue from each hog. This inspection, of course, is carried on by the U. S. Bureau of Animal Industry, which controls the U. S. Federal Meat Inspection System.

The effect of the trichnia spiralis in man, I need not refer to, as it is a condition with which you are probably all more or less acquainted.

Of the tapeworms, the taenia solium and taenia saginata are by far the most common; the former, viz., taenia solium, results in man from eating measly pork, as the pig is the intermediate host of the taenia solium; in other words, the flesh of the pig harbors the cysticercus cellulosae, which when eaten by man, develops into the mating parasite.

The taenia saginata, or the unarmed taenia of man, is produced by eating beef containing the cysticercus bovis which when taken into the intestinal tract also develops into a mature tape worm. There are other parasitic affections I could refer to along this same line, but what I have gone over I think is sufficient to show that such transmissions are comparatively common.

So far I have been specific as to the diseases and conditions communicable from animals to man, but we must also remember that there are many other conditions in animals which can produce deleterious effects in man. I refer here especially to diseased animal products, other than those already mentioned in my paper, e. g., if an animal is affected with

some febrile disease at the time of slaughter, its meat is unfit for consumption. Many cases of gastro-intestinal disturbances, I dare say, can often be attributed to such conditions. In view of these facts modern systems of meat inspection have been organized to a considerable extent in all parts of the world. Again, animals and animal products frequently act as the intermediate bearers of infectious diseases peculiar to man, e. g., typhoid fever is frequently spread by means of an infected milk supply.

With this paper I have attempted to impress upon you the importance of comparative medicine and while I have not gone into this question as deeply as I should have done, I hope you will appreciate the fact that many diseases of animals are communicable to man.

M. JACOBS, V. M. D.

CORN CULTURE IN MIDDLE TENNESSEE.

IN a recent issue of the U. T. Farmer the best methods of selecting seed corn were treated at length and it seems that an article upon the cultivation of corn would not be amiss at this time. Best results have been obtained in this part of the state by deep fall plowing and sub-soiling on stiff clay loams while on sandy soils the subsoiler is never used as it makes the soil too porous. Fall plowing admits air into the soil, thus hastening decomposition of organic matter and making the soil warmer in the spring. Land plowed in the fall also contains more moisture than land plowed in the spring, and when we think of the two hundred and seventy pounds of water necessary to produce one pound of dry matter we see that it is very important that before planting, the soil should be well stored with moisture. The winter freezes give a mellowness to the soil and in early spring a disc harrow or, if the winter rains have not compacted the soil too much, a spiked-toothed or smoothing harrow may be run over the ground and a nice seed-bed thus prepared. Saying nothing as to the method of planting, we presume the seed to be in a suitable seed-bed and now awaiting germination and cultivation.

To understand the kind of cultivation necessary for certain plants we must know their habits of growth. When the corn plant is only an inch in heighth it has a root eight inches in length, and by the time it is from eight to ten weeks old the soil between the rows is completely occupied by the hundreds of roots sent out from one plant. Most of these roots grow laterally within four inches of the surface until they reach a distance of several inches from the plant when they turn down and grow deeper into the soil.

Now, since we know something of the root system of the plant we must devise means to protect these roots and at the same time to give them moisture through which medium soluble plant food is made available. This plant being a surface feeder and having no tap root like cotton should

not be cultivated so deeply as to break away the tiny roots. Deep plowing also exposes more surface to the sun and evaporation is thereby increased. The greatest secret in raising corn is in supplying the plant with plenty of mosture. There may be ever so much plant food present, but unless there is moisture present at all times during growth, the plant food will avail nothing, as no food can enter the plant except it be taken in through the tiny root-hairs in the form of a solution. Not only should this moisture be present in the soil, but it must be brought in immediate contact with the roots and it is here that shallow cultivation proves its effectiveness. Most of the roots lie within four inches of the surface, therefore the prime object sought is to keep the moisture there also. By harrowing the ground while the plants are very small or by using other surface working implements when plants are larger a muleh is formed which checks capillarity just where the roots are located, while if deep cultivation were practiced not only would capillarity be stopped below the lateral root-system, but the roots themselves would be torn away, hence a double injury would be the result.

Now, while shallow cultivation will give the best returns on land well prepared there may be some room for argument for deep-plowing on land poorly prepared, where the cultivators have to serve the purpose of plowing the soil as well as checking capillarity and destroying weeds. In the latter case the loss in heavy root-pruning would be overcome by the gain in deepening the soil so as to increase its water holding capacity and to form a better medium for root development.

As there are so many different types of soils even in middle Tennessee, there can be no iron-clad rule given as to the proper method of cultivation, but there are, no doubt, certain facts that are true on any soil, and there are only a few of these facts that have been treated briefly in this article.

A. N. MILLER, EX., '08.

Rutherford County.

THE VALUE OF BEES TO THE FARMER.

Procul! O procul este profanae!—*Sibyll.*

BEES ought to be of great value to the farmer, as they require very little care and very little space, compared to what is required by many other things on the farm. He will derive a good deal of satisfaction out of bees, because they will return him honey enough to last a whole year. And the honey thus received can be either sold for a good profit or used for home consumption. If the farm is properly situated, the bees will prove valuable and bring in extra money that hadn't been looked for before. It will prove more profitable in the beginning to start with only two or three colonies and gradually increase the number of hives. But do not try to have too great a number for the amount of bee pasture available, as the bees will soon exhaust the limitable supply and

the farmer will then have to furnish them with food to keep off starvation. After he has increased the number of hives to eight or nine, he will find that the honey obtained from them will supply his home demand. Then if he wants to sell the honey, he will need all the way from thirty-five to forty, or even a hundred hives to keep up with the demand of his customers. If any more are wanted it is best to scatter the hives in unused fence corners about the farm so as not to exhaust the pasturage at one place. Many successful bee-keepers scatter their stands in places many miles apart and the farmer who follows this plan will undoubtedly increase his store of honey.

Modern hives, of uniform shape and size, will prove more valuable than the old log-gum hives, as the bees can be more easily controlled and managed in the modern hives, which have movable frames. The honey, in this case, can be taken out with the least trouble, and the bees, when they swarm, can be transferred to another stand without half the trouble that was required by the old box hives. The cost of maintaining the hives will be considerably less, if all the hives are of the same size and kind, because the parts are then interchangeable, and when not in use in one hive, can be used in another without any trouble. As to transferring, the best time is when the fruit trees are just beginning to bloom, for then the bees can obtain their own food and will not have to be fed at the expense of their owner. But the farmer will find it much better to leave the bees alone and not transfer them unless necessary. The spring is the time when the colonies begin to divide and this is the best time to buy bees. Very little capital is required to start with, as the beehives containing colonies can be bought from say $1.50 to as high as $10. When your own beehives have increased and contain more bees than can be kept with profit, the farmer can then sell his surplus, getting from seventy-five cents to as much as $10 for a queen. Just to think of receiving that much for one little insect, that you regarded before as almost not worth bothering about! The honey can be extracted from the combs, and the wax left can be melted in a special frame placed in the sun, and sold for about twenty cents a pound. Thus there are three things to sell at a profit, namely, bees, honey and wax.

Besides the money consideration, there is also another practical value derived from keeping bees. The farmer will learn that the time spent among the hives will be a pleasure and both interesting and fascinating. He will come back to his house, tired, both in soul and body, from his day's work, and probably a frown and a cross word for his family. But if he will spend a few minutes among his bees every evening, taking out some honey, straightening a hive on its stand and examining the inside of several hives for dead bees and other insects, he can have no idea how this will rest him, and give some of the most delightful hours he ever spent. This has been testified to by many farmers who have raised bees not only for the money, but far more for the peace of mind derived from caring for them. Still another thing to be noticed is the

good example that the bees can set some farmers by their industrious ways which have been pointed out even by the ancients. It is instructive to study how perfect is the order in their little republics. Each bee has his duty to perform and will give up his life for what he may consider the best interest of his "country." Thus the bee can teach a lesson in patriotism, so much needed now.

When bees are kept on the place, the farmer will think of planting flowers, and will, by experience, find that buckwheat and alsike clover will yield the largest amount of honey.

ANDREW JACKSON, '09.

A PRUNING PROBLEM.

COMMERCIAL orcharding in East Tennessee is gradually coming to be recognized more every year as a source of income to the farmer. There are a few fruit growers in this section of the state who are producing fruit at a profit, but the typical East Tennessee orchard is worthless to the farmer as an investment, from the fact that no care whatever is taken of the young trees. The orchard is pastured,

An Apple Tree Trained to a Central Stem

rabbits are allowed to girdle the trees, insect pests and fungous diseases make their ravages during the growing season. All these agencies, coupled with poor cultivation, are the greatest hinderances to the development of commercial orcharding in East Tennessee. To illustrate, the writer was asked to prune a typical East Tennessee orchard some weeks

ago. The trees in this orchard were planted on two different plats of land, one located in the bend of a small river that was subject to overflow during high water, the other located in a cove at a higher altitude overlooking the first plat. Neither of the locations are good orchard sites, but the latter is the better of the two. The trees were seven or eight years old and they never had received any attention other than the incidental cultivation given them and the surrounding crop. This crop had been corn and wheat, and the orchard had evidently been pastured from the time the corn was harvested until planting time in the spring. The greatest injuries had been caused by rabbits and the overflow. The effect of girdling was that a number of water sprouts started from below the girdled area, which gave a number of tall, slender trees crowded close together, instead of one vigorous, well formed tree. The orchard located in the

Short Course Students Pruning Trees in a Young Orchard

bend of the river was damaged by the overflow, some of the trees were washed down with their crowns buried in the mud and the bodies of those that were left standing were bruised and skinned. This orchard had also received the treatment that is commonly practiced among the farmers which is to cut off the lowest branches of the trees up to the height of four and one-half to six feet in order that some crop may be grown close to the trees. The result of such negligence is, that only a small per cent of the trees planted survived, and a still smaller per cent will come into fruiting.

The question might then be asked, can a farmer re-establish such an orchard and make it a paying investment? The answer would be in the negative. In the first place the location is not an orchard site. Furthermore, the trees are too old and have been neglected too long to ever be developed into a paying commercial orchard. However, if the farmer has

a small orchard of this type, he can make a family orchard out of these neglected trees by careful pruning and by paying attention to insects, fungi and cultivation. The first step in pruning such an orchard would be to remove all the "water sprouts" as far as possible, leaving only the original tree, if not damaged too much by rabbits and pasturing; but if it is damaged too much, leave the best water sprout. It will often happen that in order to make a symmetrical tree two sprouts will have to be left because there are branches only on one side of the majority of sprouts. The next step would be to thin the branches out on the main stem that are not well placed, but being careful not to spoil the symmetry of the tree. The last operation would be "heading the tree in," that is to cut back the branches to five or six year old wood. This severe treatment should be followed by less severe pruning for three or four years, attention being given to saving the water sprouts wherever needed to complete the symmetry of the tree. These trees can never be made to approach the ideal commercial orchard tree, but if the location is a good orchard site it will pay the farmer to revive such trees for a family orchard.

V. S. BRIGHT

CULTURE OF THE BLACKBERRY.

THE blackberry is about the easiest of the berries to raise, but the wild fruit is so common in Tennessee that the home trade for cultivated varieties is very limited, unless they are extra early. Early Harvest is about, if not the earliest of the varieties. There is always a demand for the first berries that ripen. Not only do they bring a better price on the home market, but they also demand more when shipped to the northern markets. So the earliest varieties should be planted.

The same variety that is grown for shipping purposes will also do for the home trade, for there are always some berries left after each shipping, and by the next time those are too ripe for shipping, but are the best for the home trade. There are several medium varieties, the Wilson, Snyder and Rathbun. But these are not as valuable for shipping, as they come later, and therefore do not bring as good prices as the earlier ones.

A good deal depends upon the location. It is more desirable to be close to the main branch of a railroad, for the freight charges are then nothing like as heavy as they are when the fruit has to be transferred from one road to another. If the grower lives a considerable distance from a railroad, the berries become soft and the juice is pressed out of them by hauling them to the station. If these are placed over some good berries, the juice will drip down through the crates underneath and by the time they reach the market the fruit will likely be mouldy or soft. So it is better to be situated close to the station to avoid this difficulty.

Blackberries will grow on most any kind of soil. It should be rich

enough, however, to produce a strong stem for the support of the fruit. If possible, they should be set in a soil that warms up quickly, because, as stated before, the early berries are the ones that pay.

A southern slope is better adapted to berries, on account of its warming up earlier in the spring. The fruit will grow larger in the bottoms or on lowlands but are so late that they do not bring the best prices. There are two methods by which plants can be produced. One is by digging up the suckers that come up from the roots, and the other is by using the roots of the whole plant. The plants are dug late in the fall or early in the winter, after the sap has gone down. After they have been dug they are cut into pieces about four inches long and put down in sand. Some prefer to put them in the ground and cover about 3 or 3½ inches deep with loose soil. The surest way is to put them down in sand. Any old box that is large enough to hold the plants will do. A layer of sand thick enough to keep the roots from freezing, is put in the bottom, then a layer of roots, and so on until all are in, and finally a thick layer is added to keep them moist. The next spring when the time comes to set out the plants, sprouts will have grown on the cuttings that were placed in the sand, and also sufficient roots will be formed for growth to begin as soon as they are set out.

The plants should be set in rows, far enough apart to admit of cultivation. As the plant has a tendency to spread rapidly by the growth of new canes, the rows should be from six to eight feet apart, and the plants about three or four feet apart in the rows. The number of plants required to set an acre at these distances is about 2,420.

The surface of the soil should be well cultivated so as to retain the moisture. After the plants have attained a good size they should be cultivated as shallow as possible, so as not to break the roots, which not only injures the plants, but also causes a larger growth of suckers between the rows, for whenever a root is broken it sprouts, sending up a sucker. The spaces in the rows between the plants that can not be reached with the cultivator, must be kept clean, and not allowed to bake.

The canes that bear fruit one year are cut out before growth begins the following season; this gives more room to the younger plants. After the new shoots have attained the desired height the top is cut out; this causes them to send out lateral branches. If the plants are well cared for, the first year after they are set out there will be considerable fruit on them. How long the plants will bear good crops depends upon situation and treatment. Sometimes the plants will fail early in their life, if the soil is not suitable. The stems become weak, and the fruit small. Under most conditions a patch, if treated well, will bear from six to eight years.

It is better to have grown people to pick the berries as they are much more careful than children. The berries should be two-thirds black when picked for shipment. If they are black all over and firm, they will be just as good, provided they do not have to lay over on the road. There

are several kinds of crates that are used for shipping. The American is used in some places, but it is not as handy as the Hallock on account of the way the boxes are made. They are made more in the shape of baskets and have to have a partition between the two layers, while the former have the raised bottoms and will set on top of one another without mashing the berries.

In the beginning of the blackberry season the prices generally run from $2.50 to $3.50 per crate, but gradually fall as the shipments increase, and as the northern berries "come in." When the price gets down to $1.00 per crate, expenses can just be paid. The packing costs two cents per quart which amounts to 48 cents per crate; the crate adds 15 cents to this and the freight and commission 35 cents, so when the total expense is taken from a dollar only about two cents are left. Therefore, when the prices get down as low as $1.00 per crate the shipping ceases. Then the berries that are left will do for canning purposes, because they can be allowed to get thoroughly ripe.

F. N. HENDERS, '09.

Students Enjoying a Rest after a Hard Afternoon's Work.

EDITORIAL.

THE EAST TENNESSEE FARMERS' CONVENTION.

The last forty years have seen the rise and fall of many agricultural associations, state and national, and among them all none has had a more useful career, nor is today in a more flourishing condition, than the East Tennessee Farmers' Convention. We have seen the passing of the National Farmer's Alliance, wrecked on political shoals. The National Grange continues a useful existence, though it seems to have lost much of its old time vigor, but the last five years have brought increased strength to the East Tennessee farmers, and the thirty-fourth annual meeting promises to be noteworthy among their successful gatherings.

The convention was organized in 1872 as an outgrowth of the East Tennessee Agricultural Society, whose purpose was the management of the East Tennessee Division Fair Association. As is apt to be the case with fairs, this one became too much localized, and in order to emphasize the breadth of the interests represented its officers sought the active support of representative farmers in every county in East Tennessee. On invitation of the fair authorities, a meeting was held in Knoxville, May 16, 1872, and in welcoming the delegates Judge O. P. Temple said: "For the first time in our history have the farmers, the most numerous and most important of all our classes, assembled in convention as a body to deliberate upon their own great interests." During two years—1875 and 1876—no meetings were held, but with these exceptions the East Tennessee Farmers' Convention has come together in annual sessions, devoting its time and energies exclusively to the upbuilding of agriculture.

The personnel of the convention embraces distinguished names in the agricultural development of Tennessee. Hon. O. P. Temple, the founder and first president, has been identified throughout a long and useful life with every movement to advance the interests of his native state. He continues to serve the convention as its honored vice-president, having been elected to this office for life. Among the men who in times past have been influential members of the convention may be mentioned Col. C. W. Charlton the first secretary; Col. Jno. M. Meek, M. P. Jarnagin, Capt. J. A. Turley and Col. J. B. Stokely. The leaders in the convention today are well calculated to uphold its best traditions, for they have made for themselves reputations as successful farmers, whose operations on the land give emphasis to whatever opinions they may express in the meetings of the convention. Such men as Clay, the Gettys brothers, Wallace, Lenoir, Deagan, Shipley, Roberts, Strong and Kefauver—to mention only a few of the practical workers in agriculture, who are enthusiastic supporters of the convention—need only be named to explain the principal reason for its great success. Men like these are an honor to any profession, and East

Tennessee is fortunate in having among its farmers such able representatives. The University has contributed not a little to the success of the convention. Professor A. M. Soule put all his forceful personality into the work of popularizing the convention during his connection with the University, and his successor, Professor H. A. Morgan, has found many ways of promoting its interests. Of late years the convention has held the majority of its meetings in the University Chapel, and members of the faculty have often appeared on its programs. The inspection of the University farms and the dairy have afforded interesting and valuable lessons to the visitors.

No single individual has done so much for the convention as the Commissioner of Agriculture, Hon. W. W. Ogilvie. In times past the proceedings of the convention have been printed by the commissioner, but it remained for Mr. Ogilvie to provide the financial assistance which has made it possible to bring men of world-wide reputation before the East Tennessee farmers. He recognized in the convention an unusual opportunity for promoting the agricultural interests of the state, and by including it among the farmers' institutes he has been able to provide in large measure for its expenses. He has interested the railroads, so that transportation is now furnished the delegates, thus greatly increasing the attendance. The railroads recognize in the convention a means of increasing the agricultural production of East Tennessee by which they will be greatly benefited.

SPEAKERS AND SUBJECTS.

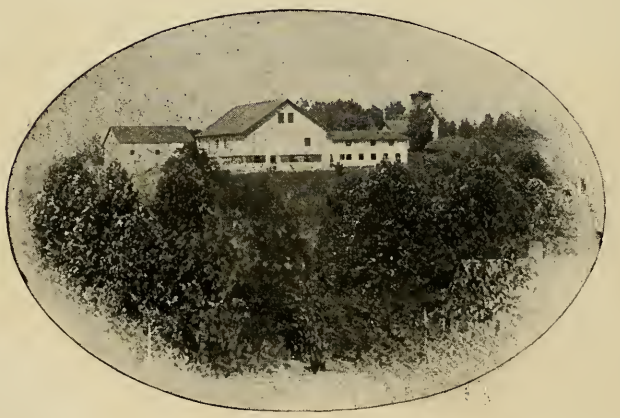
During the early years of the convention the speakers were prominent farmers of East Tennessee, with an occasional lecturer from the Department of Agriculture at Washington. Looking over the papers read at these earlier sessions, one is impressed with the value of successful experience in farming; and it is an open question, even in the meetings of today, when men of national reputation are frequently heard, whether quite as much of direct experimental value is not contained in the addresses of our own men, who have demonstrated on their own farms the soundness of the methods they advocate. The lectures of such men as the Hon. James Wilson, Secretary of Agriculture; Professor Holden, of Iowa; Professor Spillman, Governor Hoard, Professor Shaw, Mr. Terry and Mr. Wing are inspiring, and it is good to have these splendid messengers from the great world beyond our borders. No one would return to the days when we were without them, and every farmer in East Tennesee is benefited by their words of wisdom; and encouraged by their presence and association; but there is a world of practical sense in the work of our own men also and the convention is fortunate in being able to command the services of both classes of speakers.

Since the first meeting the topics discussed have been of live interest to the farmer. Party politics has no place in the program or the policy of the East Tennessee Farmers' Convention. Year after year new phases

of subjects as old as Tennessee agriculture have been presented: The soil and its improvement, beef and dairy cattle, horses, sheep and swine, forage and grain crop rotation, roads, fences. These have been the leading topics that have engaged the attention of the farmers. Of scarcely less importance have been subjects bearing on the life of the farm—education in all its phases, social conditions, domestic conveniences, the farm, orchard and garden. Whatever would make for the betterment of farm life has had its advocates before the East Tennessee Farmers' Convention.

It is not strange with such a membership and such ideals the convention should have developed a national reputation. The great leaders of agricultural thought throughout the country esteem it an honor to be invited to a place on its program, and its influence in rural affairs is steadily broadening and deepening.

The U. T. Farmer is glad to welcome the convention to the University of Tennessee. The Agricultural Club hopes to benefit as much from its deliberations as from any opportunity the year has presented. The next issue of the U. T. Farmer will be devoted largely to its proceedings.



LOCALS AND PERSONALS.

Upon a more thorough examination at the University Fruit Farm it was found that the recent cold weather had done a greater damage than was at first supposed. There will not be more than one-half a crop of strawberries, raspberries and grapes, since all the early flowers were killed. The apple crop was damaged to a greater extent this year than it was in 1905. The cold weather has hampered experiments greatly.

Prof. H. A. Morgan recently bought for the Experiment Station a first class Hereford heifer. This is very gratifying to the agricultural students, for the work in stock judging has been greatly hampered by not having some model beef animals to score.

Prof. S. H. Essary and Prof. S. M. Bain are making cuttings and transplanting last year's selections of immuned red clover. They report that the plants are doing well and that they expect to get some good results this year.

Prof. Bain will leave the latter part of the month for Clarendon, Ark., to replant his experiment cotton which was killed by the recent cold weather.

Mr. H. H. Hampton, assistant chemist, spent a few days last month visiting his relatives in Chattanooga, Tenn. He reports having had a pleasant time.

Prof. H. A. Morgan, Mr. Cotton and Prof. C. A. Mooers attended a meeting held in Chattanooga from April 22 to the 27, for the instruction of the cattle tick inspectors of Kentucky, Alabama, Tennessee and Georgia. The inspectors are under the direction of the Animal Bureau, Department of Agriculture, Washington, D. C. They report having had a very interesting as well as practical meeting. The U. T. Farmer wishes the inspectors well in their great undertaking of destroying the notorious cattle tick which has hampered cattle growing in the South so long.

The Senior class in Plant Breeding, under the instruction of Prof. C. A. Keffer, has been doing some excellent work for the past three weeks at the University Fruit Farm, crossing strawberries, raspberries, blackberries, and grapes.

Prof. Bain, V. S. Bright, and Herman Work are at present planning a trip to the Smoky Mountains where they go to plant some experiment cotton on the top of Thunderhead.

Since the beginning of this month the Agricultural Experiment Station has been receiving complaints of serious injury to grass and wheat crops by army worms, from many points in Midd[illegible]and East Tennessee. The greatest damage has been caused in the sout[illegible]rn part of the Middle

Section, but many complaints have been received from Knox and other counties of the Eastern Section. The cold, backward spring is responsible in a large part for these outbreaks, as such weather checks the increase of the natural enemies of this pest. With the advent of warmer weather a rapid decrease in the amount of injury is fully expected. The Entomological Department of the Experiment Station is at present studying the outbreak near Knoxville.

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BUD VARIATION OF THE IRISH POTATO.

INTRODUCTION

TO the careful observer the potato plants of one variety in a field present many differences. When they are sprouting, variation is evident; some will be two weeks in advance of others. Then, as growth progresses, differences in vigor, height, pubescence of leaves and in freedom from blight, all appear. But variations of the underground parts are at least as marked, and as this is the most important consideration, we are naturally more interested in the variations of the tubers.

It is a matter of common observation that when the first potatoes are dug for table use, one hill is not as good as another, though all are of the same variety and age, and are apparently in like soil conditions. In some of the hills practically all of the tubers will range in size from that of a walnut to a base ball, while in others near at hand there will be scarcely any large enough to use. This is a remarkable phenomenon, but is too common to excite comment. Moreover, if the field is watched at ripening time, marked variations may be observed. Some plants will die more than a week in advance of others. When the crop is dug the product of the hills will be found to vary in weight from a few ounces to several pounds. In some hills the same weight will be put in four large potatoes that is put in ten tubers in other hills. Such differences are not questioned by the grower; he denominates them as "natural," and thinks no more about them.

Of course, unequal fertility of the soil, unequal size of the seed tubers, varying attacks of insects and fungi, all have their share in causing these variations, but there remains certain divergences from the parent type that cannot be explained away. This we call "bud variation." Two potatoes of equal size, and of the same market variety, may not be equally valuable as seed; one may have double the potentiality of another. Examples of such will be found later.

Having in mind some of the above considerations and in view of the great achievements in breeding and selecting plants, the writer began experiments with Irish potatoes June 1, 1905. The apparent object was to determine what improvement or retrogression could be accumulated

by careful selection, depending upon bud variations for the starting points and for the basis of further development. But all that could reasonably be expected in so short a time as was available was a more intimate acquaintance with plant individuality and a preparation for work along similar lines in the future.

The work was begun by selecting from the plots, .3 of an acre, 115 of the most vigorous plants and 18 of the least vigorous. One variety—Bliss' Early Triumph—was used. The salable potatoes from each selected plant or hill were placed in separate bags, which were numbered respectively, 1 to 115 and 116 to 133. Weights were made of the salable potatoes from each hill and both salable potatoes and culls were counted and recorded. The selected salable potatoes were wilted for several days, when the bud end was cut off and rejected, the rest of the potato was left entire, cut in 2, 3 or 4 pieces, according to its size. Thus each piece would contain from 1 to 5 or 6 eyes, and the pieces would not be very unequal in size. The product of each hill was planted in a separate section of a row which was given the number of the hill. Hill No. 1 was planted in Section No. 1.

Some notes were taken on dates of sprouting, rate of growth and date of maturity.

When mature, each section—the progeny of one hill—was harvested and weighed separately. The best hill from each section, from 1 to 115, was saved for seed. The hill saved for seed was given the number of the section; e. g., the best hill from Section 1 was given 1 for its number. Complete records of weights and numbers of tubers from each hill were kept. In the case of hills 116-133, tubers from the least vigorous plants were saved for seed.

VARIATIONS IN METHOD OF SELECTING FROM YEAR TO YEAR.

In the third and fourth crops the selections were based on underground parts—the tubers. In other respects there was no change in the methods of selection of hills 1-115. But in case of hills 116-133, during the third and fourth crops, the best were selected. This made a fairer test than continuous selection of the least vigorous or poorest hills, as by the latter method the exceedingly small potatoes that were obtained for seed would not contain near as much plant food as the larger tubers from the more vigorous plants. But by altering our method of selecting seed, tubers from Sections 116-133 were about as large as those from 1-115. It must be remembered that the smaller potatoes were not cut, but planted whole, with the exception of the bud end. Yet hills 116-133, with an ancestry for at least two years of small potatoes and small producers, would be expected to show indications of that ancestry, and they did.

Thus we now have a pedigree of those of the 133 original hills, that have survived for four generations, and a fifth crop is planted.

Below is the form in which the records were kept:

Table No. 1—Sample Record.

Date of Harvesting	Section	Saleable Potatoes	Small Potatoes	Hill for seed Potatoes	No. Salable	No Small	Wt. Salable	Wt. Small
June 1, 1905	0	0	0	5	7	0	16	0
Nov. 1, 1905	5	6.25	3.75	5	2	1	4	.75
July 4, 1906	5	44	1.75	5	6	0	19	0
Nov. 1, 1906	5	73	21	5	3	1	12.5	5
June 1, 1905	0	0	0	26	6	1	18	0
Nov. 1, 1905	26	18	2.25	26	4	0	7.25	0
July 4, 1906	26	74	16.5	26	3	0	12.5	0
Nov. 1, 1906	26	16.5	3.5	26	2	2	6	1.75
June 1, 1905	0	0	0	51	9	3	30	0
Nov. 1, 1905	51	116.75	19	51	4	1	15.5	1.5
July 1, 1906	51	131	12.5	51	6	0	18.75	0
Nov. 1, 1906	51	5.75	10.25	51	2	2	5.75	1.75
June 1, 1905	0	0	0	114	5	8	5.5	0
Nov. 1, 1905	114	48.5	0	114	3	0	34	0
July 1, 1906	114	95.5	5.25	114	5	0	15.5	0
Nov. 1, 1906	114	16.5	11	114	2	2	3.25	1.75
June 1, 1905	0	0	0	117	2	3	3	0
Nov. 1, 1905	117	2.5	2.5	117	1	2	2.5	1.75
July 6, 1906	117	14.5	0	117	2	0	4.75	0
Nov. 1, 1906	117	11	0	117	3	0	6.5	0
June 1, 1905	0	0	0	125	1	3	.75	0
Nov. 1, 1905	125	2.25	1.25	125	1	2	2.25	1.5
July 6, 1906	125	7.25	0	125	1	0	2.5	0
Nov. 1, 1906	125	2	.5	125	1	1	3.25	.5

In the last section tabulated it will be observed that the first three spaces opposite the date of harvesting—June 1, 1905—are marked 0. But it must be remembered that at that time the work was begun, so there was but one hill which was given the number (125) and contained one salable potato that weighed .75 ounce, and three small ones that were too light to be weighed. After the second harvesting—Nov. 1, 1905—the progeny of hill 125 is included in section 125 and consists of 2.25 ounces of salable and 1.25 ounces of small potatoes. The best hill, which in this case proved to be only hill, was saved for seed and given the number (125) of the parent section. This hill contained one salable potato that weighed 2.25 ounces and two small potatoes that weighed 1.25 ounces.

SOME PRECAUTIONS TO BE TAKEN IN THE FUTURE.

Though the variation was very great, as may be seen from the table above, much of it was due to other causes than bud differences. Dissimilar soil conditions probably were the greatest disturbing factors. No two potatoes stand in identically the same soil, and the difference in the same field or plat may be considerable, though outwardly not apparent. When I inverted the order of planting the potatoes, putting No. 133 where No. 1 had been, there was a very noticeable change in yield, which was undoubtedly due to soil conditions. So in the future the soil will be made over-rich, i. e., potash and phosphoric acid will be added until further additions give no results and more nitrogen will be added from year to year than the plants can use.

Again, the stored food in the potato, on account of its eminent suitability, is a great help in starting off the young plant, thus giving it an advantage that lasts through the entire season and is evident at harvest time. If what the majority of the horticulturists say about the superiority of the buds in the bud end be true, then the following figures show very conclusively that the stored food in the tuber is a great stimulus to the plant.

Forty-two hills planted with the bud ends of potatoes, yielded 64.5 pounds of salable potatoes; 42 hills planted to the halves of the tuber, from which the bud end had been removed and used in the first case, yielded 93 pounds of salable potatoes. So, in the future, I would use seed pieces of equal size. They should be pared until of equal weight.

Another varient that may disturb the results greatly is exposure to the hot sunshine. When the first crop is harvested, or when planted, exposure to the sun for even a few minutes may decrease the vigor of the resulting plants or may cause an absolute failure. To avoid injury from the sun's rays, each section, as soon as dug, should be carried immediately into the shade, and a section should be covered as soon as planted, the latter being much the more important of the two.

The plants should be regularly sprayed with Bordeaux Mixture, to

Cut 1.

Cut 2.

which some Paris green has been added, to avoid injury and consequent loss of results, by blight and insects.

Each of the above doubtless has had its share in rendering less conclusive our results, and if they are given the proper consideration in the future, more definite conclusions may be reached.

OBSERVATIONS DURING GROWTH.

The observations made during growth have been general rather than specific. In the first place, there has not been time enough for conclusive results. Secondly, I do not consider the second crop of the season, as I have been able to grow it, reliable for such observations. Since all of the first crop is dug at once, some of the individual plants must be more mature than others. Moreover, when the tubers are wilted, the conditions may be more favorable for maturing the buds in some cases than in others. So, when the second crop is planted, they are not equally mature. True, the potatoes that mature late may be late strains, but other conditions may

have caused part of them to be late and may thus render valueless the results from those plants affected. I think it is safe to assume that the potatoes used in determining the extent of bud variation must be mature.

Differences in Sprouting.

Great differences appeared in the time of sprouting. The plants in some sections would be uniformly three or four inches tall, when those in adjoining sections would be breaking through the ground.

Cut 2 shows plants a week behind those in cut 1.

As growth advanced, the differences between the sections were still evident. Cuts 3 (foreground) and 4 (at foot) show marked differences, while cut 5 shows a decided variation within the section; but this is the exception—the plants in a section were usually uniform.

Our notes indicate that those that sprout first are first to mature. Six out of eight plants early to sprout were early to mature, while only two out of eight late to sprout were early to mature.

Cut 3.

Cut 4.

Differences in Date of Maturity.

That there were vegetative variations, no one who saw the experiment plot could question. They were apparent from sprouting to maturity. But what is most significant is that some of these variations that appeared one year were repeated the next in the same strain. No. 41 was early every crop under observation, and Nos. 33, 57, 60, 65 and 71 were early two out of three crops (only three crops were observed for dates of maturity), and were average in maturity the third crop. So these facts, though not extensive, do indicate that earlier strains might be selected from the common stock, Bliss' Early Triumph.

Differences in Height, Growth, Vigor, Etc.

The exact differences in height, growth, vigor, pubescence of leaves and resistance to blight were not recorded, but variations in all of these respects were noticed.

OBSERVATIONS ON MATURE PLANTS, OR YIELD.

Range in Variation.

In one year the variation in yield of salable potatoes ranged from 1.75 ozs. in the lightest hill recorded, to 34 ozs. in the heaviest. The ten lightest hills averaged 2.23 ozs. and the ten heaviest averaged 21.28 ozs. The average weight of salable tubers ranged from 1.5 ozs. in one hill to 11.33 ozs. in another. The average weight of salable potatoes in ten hills was 1.85 ozs., while in another ten hills the average weight was 7.03 ozs.

In Table I wide variations in the weight of hills from different strains and from same strains may be observed; also a variation in the weight of tubers from .75 oz. to 3.33 oz.

The above variations occurred in the plants under observation during one year, but marked variations were observed between certain plants and their own progeny from crop to crop, and these are the differences that offer the greatest opportunity for the improvement of the variety.

The range in variation was much greater in some cases than in others. For example, the first, second, third and fourth crops of No. 86 were, re-

Cut 5.

(Note small plant in foreground)

spectively, 19 ozs., 19.25 ozs., 13 ozs. and 6.75 ozs. These variations are comparatively slight when the last crop, which was a very unsatisfactory one, is not considered. On the other hand, No. 1 varied as follows: 23 ozs., 2.25 ozs., 11 ozs., and 3 ozs. Again, referring to Table I, variation is seen from crop to crop both between strains—the progeny of single hills—and among the offspring of the same parent hill. For instance, Nos. 26 and 51 are uniformly higher than Nos. 117 and 125, and, on the other hand, see the wide variation between the selected hills from the four crops of No. 114.

In weight of tubers from the best hills, there may be observed a wide variation among the numbers tabulated. The average weight of the salable tubers from No. 51 is comparatively constant through the four crops, being about three ounces for three crops and four ounces for one.

But plant No. 114 shows its great variability in size of tubers as well as in yield—the tubers of the largest hills ranging from 1 to 11 ozs. each.

Opportunity for Selection for Earliness.

Since even within the brief period of four succeeding crops there has been a considerable variation in sprouting and those which sprouted earliest were earliest to mature, ripening ten or twelve days before many others, and since this earliness was constant in a few cases at least, it seems reasonable to conclude that early, medium and late varieties or strains may be selected from any well-known market variety. It will doubtless require long and patient selections through many years to establish varieties that are very widely different in time of maturity, but to select strains a week or more earlier or later would seem but a matter of a few years.

For Size of Tubers.

There was conclusive evidence that some strains produce uniformly larger tubers than others. The average weights of the salable tubers from the best hills of ten strains were for four crops, respectively: 2.48, 4.05, 4.83 and 2.51 ozs. The average weights of salable tubers from the best hills of ten other strains grown under similar conditions and selected for the same purpose as the above were 1.3, 3.1, 2.7 and 2.33 ozs. From the above figures it may be seen that there is considerable variation in the average weight of tubers from crop to crop in the entire field and that there is much greater variation among the different hills of the same crop, and what is of the greatest importance, that some strains uniformly produce larger tubers than others.

For Yield.

The average weight of the salable potatoes from the best hills in five selections made from the least vigorous plants, or from strains 116-133, was 1.9, 1, 4.65 and 1.92 ozs. for each crop, respectively, while the average weights of salable potatoes per best hill from five strains selected for vigor and high yield were 19.15, 16.35, 16.05 and 7.35 ozs. each of the crops, respectively. Moreover, among the strains of potatoes that were being selected for high yield, one plant produced 34 ozs. of salable tubers, while among those selected for small yield the best hill found produced only 10.25 ozs., or less than a third of what the former hill yielded.

For Blight Resistance.

No systematic observations were made on blight, but from the varying extent that plants growing together blighted, it seems reasonable to believe that by careful and constant selection a blight-resisting strain may be established.

Selections for Small Size and Yield.

The tables below give some idea of the results from selecting for small and large tubers:

Table II.—Weights of Tubers Selected for Small Size.

Strain	Weight per Tuber. 1st Crop	2nd Crop	3rd Crop	4th Crop	Average for each strain during the four Crops
No. 116	1.75	2.5	2.00	0.00	2.08
No. 177	1.5	3.00	2.5	2.33	2.33
No. 118	1.00	2.00	4.00	0.00	2.33
No. 120	1.00	2.00	2.33	1.5	1.7
No. 123	0.5	3.5	1.5	0.00	1.83
No. 125	0.75	2.00	2.00	3.00	1.94
No. 130	0.75	0.00	1.5	0.00	1.12
No. 131	2.00	2.66	1.5	5.00	2.54
No. 132	1.00	3.00	2.00	2.33	2.08
No. 133	1.25	0.00	3.00	1.00	1.74
Average for the ten strains each crop	1.05	2.58	2.23	2.53	

Table III.—Weight of Tubers Selected for Large Size.

Strain	1st Crop	2nd Crop	3rd Crop	4th Crop	Average for each strain during the four crops
No. 1	2.3	2.00	1.83	3.00	2.28
No. 5	2.28	2.00	3.16	4.00	2.86
No. 12	4.00	4.00	2.8	3.00	3.45
No. 14	2.8	3.00	7.6	3.00	2.85
No. 61	1.4	4.00	2.5	2.00	2.48
No. 72	1.7	3.00	2.00	1.00	1.93
No. 74	1.6	3.00	4.00	2.5	2.94
No. 83	2.2	3.5	3.5	2.33	2.88
No. 94	1.66	3.00	2.5	0.00	2.39
No. 103	1.33	2.00	2.5	0.00	2.00

Improvement by Selection.

That there are great variations in potatoes, there is no doubt, but if there can be no augmenting of desirable characters or eliminating of undesirable characters, there would seem to be no value in such study as we have made of a market variety of potatoes. There has been distinct improvement in yield in some strains and improvement in size in others.

The tabulation below gives examples of improvement in yield. (The fourth crop is not to be counted for reasons previously given.)

Table IV.—Improvement of Yield.

	1st Crop	2nd Crop	3rd Crop	4th Crop
No. 23	7.5	10.75	17.75	5.5
No. 43	6.5	8.75	15.00	3.25
No. 49	4.00	6.25	9.75	14.25
No. 50	5.25	7.25	17.00	6.5
No. 52	7.00	9.5	15.5	3.00
No. 107	4.00	9.5	18.00	4.5

If the fourth crop be omitted, Table V presents further evidence of increase in size of tubers. The general average at the bottom of the columns are most significant:

Table V.—Average Weight of Salable Potatoes.

Strain	1st Crop	2d Crop	3rd Crop	4th Crop
No. 24	3.00	2.41	5.25	4.00
No. 26	3.00	2.41	4.16	3.00
No. 27	2.1	4.5	4.62	2.00
No. 50	2.62	2.41	4.25	3.25
No. 62	2.5	9.62	3.87	2.14
No. 77	2.00	3.5	8.25	1.25
No. 78	2.25	6.00	5.25	4.00
No. 86	3.16	3.81	4.33	3.37
No. 91	2.00	2.65	4.12	1.33
No. 110	2.85	3.16	4.12	0.00
Average weight of the ten strains for each crop	2.475	4.05	4.825	2.51

DESCENDANTS THROUGH DIFFERENT LINES FROM SAME ANCESTOR.

From some of the characteristic strains of the second crop of pedigree potatoes there were saved two of the best hills, instead of one. Thus, from the progeny of the original No. 1, there are two lines of descent, those classed under No. 1 and those under No. 2A. The plants today growing in section 1 and in section 2A have a common ancestry in a single bud. So, if there are iron-clad laws of heredity that permit no variation from the parent type, we should expect sections 1 and 2A to behave exactly alike. However, a glance at the table below shows great variation in the progeny of a common ancestor, e. g., compare 1 and 2A or 41 and 12A.

Table VI.—Variation.

STRAIN	1st Crop ozs.		2d Crop ozs.	3d Crop ozs.	4th Crop ozs.	Totals for each No. for the 2d, 3d and 4th crops. ozs.	Totals of each strain.
No. 1	23	1[1]	2.25	11	3	16.25	46
		2a	8.25	12.5	9	29.75	
No. 13	10	13[1]	6 5	11.75	9.75	28	60.25
		7a	5.25	15.5	11.5	32.25	
No. 28	21.75	28[1]	4.5	20.5	11	36	64.75
		11a	9.25	12	7.5	28.75	
No. 41	8	41[1]	2.75	14.75	2.75	20.25	42
		12a	4.5	8.25	9	21.75	
No. 46	18	46[1]	4	9.25	9.25	22.5	54.25
		13a	7.25	13.75	10.75	31.75	
No. 47	22.5	47[1]	8	7.25	1	16.25	49.25
		14a	5.25	21.75	6	33	
No. 48	13.5	48[1]	5.75	13.25	7.25	42.25	65.75
		15a	6.5	24.5	8.5	39.5	
No. 51	30	51[1]	15.5	18.75	5.75	40	88.75
		16a	11.25	25	12.5	48.75	
No. 62	17.5	62[1]	19.25	15.5	15	49.75	83.25
		19a	12.5	13	8	33.5	
No. 78	18	78[1]	12	10.5	8	30.5	54.25
		20a	10	9.5	4.25	39.75	
No. 86	15	86[1]	19.25	13	6.75	39	75.5
		24a	17	12	7.5	36.5	
No. 88	12	88[1]	13	4.5	2.5	20	50.75
		21a	22.25	4.75	3.75	30.75	
No. 124	75	124[1]	0	0	0	0	20.25
		17a	3.25	8	9	20.25	
No. 130	75	130[1]	0	3	0	3	15.5
		18a	0	6.5	6	12.5	

Yet, there is in the above tabulation unmistakable evidence of heredity, e. g., the difference between the numbers in the seventh column opposite 62[1] and 19A—48.75 ozs. and 33.5 ozs.—is much slighter than the difference between 48.75 ozs. opposite 62[1] and 20.25 ozs. opposite 41[1]. The totals in the seventh column opposite 130 are much nearer each other than the 3 ozs. opposite 130[1] is to the 39.5 ozs. opposite 15A. So, however this table is studied, evidence both of the laws of heredity and of variation are exhibited.

BUD VARIATION A MEANS OF IMPROVING OR MAINTAINING VARIETIES OF POTATOES.

From what really conclusive evidence has been obtained during this experiment, I can not say that any radical improvement can be made by constant selection, based on the slight variations that appear from year to year. But by selecting the mutations that appear from time to time in any variety of potatoes, I believe I have conclusive evidence that practical improvement may be made. In Table VII it may be observed that the average yield per best hill of Nos. 51, 53, 78 and 86 is more than double that of Nos. 52, 77, 79 and 87. I chose these strains because they have grown adjacent to each other; 52 grew between 51 and 53, yet note the difference in yield; 78 grew between 77 and 79, but is practically double either in yield; and 86 joins 87, but more than doubles it in yield.

Table VII.

	Best Hill 1st Crop Ozs.	Best Hill 2nd Crop Ozs.	Best Hill 3rd Crop Ozs.	Best Hill 4th Crop Ozs.	Total of 4th Crop Ozs.	Average Ozs.
No. 51	30.00	15.5	18.75	5.75	70.00	17.5
No. 53	10.25	12.75	14.5	10.00	47.5	11.88
No. 86	19.00	19.25	13.00	6.75	58.00	14.5
No. 78	18.00	12.00	10.5	8.00	48.5	12.12
						56.00

56 divided by 4 equals 14 ozs., average yield per hill.

No. 52	7.00	9.5	15.5	3.00	35.00	8.75
No. 77	4.00	14.00	8.25	1.25	27.5	6.88
No. 79	5.00	7.00	4.5	0.00	16.5	5.5
No. 87	3.25	6.00	10.5	0.00	20.00	6.66
						27.79

27.79 divided by 4 equals 6.94 ozs., average yield per hill.

In the strains tabulated above there is conclusive proof of bud variation and I think that here are examples of mutations. In 1906, the progeny of strain No. 51 yielded slightly over 14.5 ozs. per hill (there were nine hills), while the average for a field crop grown under similar conditions in the horticultural grounds was a little upwards of 3.5 ozs.

Basing my conclusions entirely on the data obtained from the potato plants that have been under my observation for four crops, I believe that the opportunity for improvement and prevention of degeneration lies in

the possibility of selecting from the potato field those plants that possess in a marked degree the characteristics desired—vigor, healthfulness, productiveness, earliness, lateness, size, etc. The potatoes selected must be grown in the test plot for a number of generations, where a very large part will be found to degenerate or to prove themselves no better than the average. Others will be very variable, ranking high one year and low the next. No. 1 is an example. The best hills for each of the four crops were, respectively, 23 ozs, 2.25 ozs., 11 ozs., and 3 ozs. However, among these variables those comparatively constant will be found, and will be worth very much more than seed saved from the harvesting of the entire crop. I believe that the method given above, of selecting seed, will be followed by much better results than the practice of regularly buying from some seed store. Furthermore, the method of selecting seed potatoes that has been outlined may be applied by the average farmer with a good profit. Whatever desirable character may be found in the potato field can ordinarily be fixed and perpetuated if rigorous and prolonged selection be carried on with large numbers.

If the market gardener could select a strain of Early Triumph potatoes—the standard two-crop variety in Tennessee—that would mature even a week in advance of the parent variety, the value of his crop would be greatly increased, for every gardener has had occasion to note the high price of earliest offerings.

L. R. NEEL, '07.

CULTIVATION AND IMPROVEMENT OF COTTON.

PART I.-COTTON CULTURE.

INTRODUCTION.

COTTON is grown between the thirty-fifth parallel of latitude north and the thirty-fifth parallel south (a region embracing over one-half of the land surface of the globe). However, it is most successfully grown between the twentieth and the thirtieth parallels north of the equator. Within this belt lie the cotton growing states of the Union, comprising an area of 600,000 square miles. Outside of the United States cotton is grown in Mexico, Egypt, Northern Africa, Southern Asia, in the Islands of the Pacific; also a large part of the Southern Hemisphere is adapted to cotton culture—a great deal of South America, Southern Africa, Australia, and numerous islands.

What has been said about the geographical range of cotton applies to the genus and not to its sub-divisions. The Sea Island cotton is much more restricted by climatic and soil conditions. It flourishes along the Atlantic coasts of Florida, Georgia and South Carolina; it is grown to some extent in other parts of America, and is extensively cultivated in Egypt. The upland cotton has given to the genus its wide distribution. This species is to be found in every cotton growing country of the world.

The cotton plant is very sensitive to climatic changes. An excess of rain causes it to develop too much stalk and leaves at the expense of fruit, while long dry seasons dwarf the plants and decrease the size of the bolls to a marked degree. The fiber is reduced in length and quality by drouth. Sudden changes of temperature are very injurious to cotton, often causing it to shed the flower buds as well as small bolls.

The average length of time intervening between seeding and harvesting the majority of the bolls is $5\frac{1}{2}$ to $6\frac{1}{2}$ months in the cotton belt where the upland varieties are extensively grown. Hence in localities where the time between late and early frosts is much shorter than the above periods, cotton can not be safely grown.

An Ideal Cotton Plant.

SOIL AND TILLAGE.

Cotton is most successfully grown on sandy and loamy soils that are well drained.

The preparation of the soil is dependent upon local conditions, so for this reason no iron-clad rules can be laid down. The stiffer clay soils are especially benefitted by fall plowing, but it is sometimes difficult or impossible to remove the crop of the current year in time. However, the predominating practice is to plow the land in February or March, 20 to 30 days before planting. Rows, 42 inches apart, are made with a shovel plow, the fertilizer is sown in the furrows, and then the soil is bedded on it with a one-horse turn plow—four furrows to the row. Two furrows

are thrown together over the fertilizer 10 to 20 days before seeding and the other two are added at seeding time. The seed bed is then harrowed down almost level. The seed are sown with a drill, at the rate of three-fourth to one bushel per acre.

The smallest quantity of seed that will insure a perfect stand should be the rate of seeding. If heavy rains fall after seeding before the seed germinate, the crust should always be broken with some light implement like a weeder. This not only aids in securing a perfect stand, but conserves moisture and destroys a crop of weeds as well.

The practice of many throughout the cotton belt is to use the "sweep" in the cultivation of cotton, to the exclusion of all other implements. At first the small size is used, but this is increased as the height of the plant will permit, until the largest size is reached. From experiments and from practice it has been found that it is not feasible, except in dry seasons, to grow cotton with perfectly level culture, because the lower limbs will be on the ground, causing the fruit to rot.

There is no fixed rule for the cultivation of cotton due to the variation in seasons and climatic conditions. However, thorough tillage can not be too strongly emphasized. The tools that are used should be of a character that will not mutilate the roots and that will maintain a dust mulch about the plants. This mulch will conserve a great deal of soil moisture and will also prevent plant food from accumulating in the dry surface soil where it would be out of reach of the plant roots.

The number of plants to the acre is very variable, depending upon the variety of cotton and the kind of soil. On fertile river bottoms the distance between rows and between plants in the row should be greater than on uplands.

The rows are seldom less than $3\frac{1}{2}$ or 4 feet apart and the plants are usually 2 feet apart in the row. With rows 4 feet apart and plants 1 foot apart in the drill, a perfect stand would give 10,890 plants per acre; if the plants were 2 feet apart in the row a perfect stand would be 5,445, etc.

The one crop system, the clean culture through the long, hot summers and the absence of cover crops through the winter have all combined to destroy the tilth and fertility of the soil. Thus the problem of increasing the fertility of the land is one of the greatest that confronts the cotton grower.

CROP ROTATION AND FERTILIZERS.

Nitrogen and humus are, as a rule, the greatest need of worn-out cotton land. True a great deal of commercial fertilizer is used, but this adds no humus and usually is not applied in large enough amounts to maintain the supply of nitrogen, phosphate and potash.

Crop rotation and stock raising in conjunction, with an intelligent use of commercial fertilizers, must be the resource of the cotton farmer who wishes to restore the fertility of his land and at the same time make a living from it.

A proper rotation of crops keeps the land busy throughout the year, builds up the soil in humus, enables the farmer to raise live stock and, if legumes are included in the rotation, helps to keep up the supply of nitrogen. Though no fixed rotations can be given that all cotton farmers should unreservedly follow, a few standard rotations are appended below that may be of some aid as suggestions:

(1). First year, corn and cow peas; second year, wheat, oats, rye, followed by cow peas for hay; third year, cotton.

(2). First year, oats, followed by cow peas; second year, cotton.

(3). First year, corn and peas or soy beans, followed by rye; second year, cotton.

Cut 6—Result of Wide Spacing in Rows.

Cut 7—Result of Crowding.

(4). First year, rye, with alsike clover; second year, alsike clover; third year, cotton.

(5). First year, lespedesa (two years pastured); third year, cotton.

Animal production in connection with cotton growing enables the farmer to grow cotton at a profit and still improve the fertility of the soil. At the Arkansas Station a system was tried that gave good results. Some live stock are necessary for a proper utilization of some of the crops grown in the rotation. Moreover, since most of the mineral plant food that is removed from the soil by a cotton crop is put into the seed, some method should be adopted that will insure a restoration of a large part of this. Such is the case when cotton seed meal is extensively fed. The oil, which has a great commercial value and no value as a fertilizer, has been extracted, while the nitrogen, phosphoric acid and potash are returned to the

stock farmer in the form of cotton seed meal. So the farmer who sells cotton fibre, dairy products or beef, and feeds cotton seed meal and other concentrates, with roughage, and properly handles the manure, and has rotations, including leguminous crops, need not see his land becoming less productive from year to year. Below is given a comparison of farm-yard manure with commercial fertilizer on soil that had been planted to cotton for three years:

	Yield Per Acre.
No fertilizer	932 pounds.
Nitrate soda, 200 lbs., 16 per cent.	1145 pounds.
Nitrate potash, 300 lbs, 49 per cent.	950 pounds.
Acid phosphate, 300 lbs., 14 per cent.	960 pounds.
Gypsum, 500 lbs.	852 pounds.
Cotton seed meal, 400 lbs., 6 per cent	1080 pounds.
Barn-yard manure, 10 tons per acre	1122 pounds.

It may be seen from the above table that barn-yard manure compares favorably with commercial fertilizers.

This subject completes the work on culture, as diseases and insects will not be considered in this paper. In conclusion, we will say there are a few mistakes that are in common practice over the entire cotton belt, viz:

1. Poor preparation of seed bed.
2. Lack of system of rotation.
3. Too many plants left per acre.
4. Deep cultivation near the row.
5. Discontinuance of cultivation ("laying by") too early.

Every cotton grower is admonished to revise his system of farming, by growing a variety of crops and by raising live stock in order that the soil may not be depleted of its fertility.

However, since stock raising forms so small a part of Southern agriculture, and rotation is practiced so little, cotton growers are forced to use commercial fertilizer in order to grow a crop at a profit. The profit to be derived from the use of fertilizer is dependent upon several factors, viz: The cost of the fertilizer, the preparation and cultivation of the growing crop, the cost of labor, season, and the selling price. There should always be a wide margin between the cost of the fertilizer and the price received for the increased yield. The question of how much fertilizer to use then presents itself. Below is given a table taken from Georgia Bulletin No. 75, which shows that the increase in yield per acre is not in the same ratio as the increase in the amounts of fertilizer used when the latter are large:

Fertilizer Formula and Results.

Acid phosphate	1000 pounds.
Cotton seed meal	498 pounds.
Muriate potash	74 pounds.
Total	1572 pounds.

Cost, $20.00 per ton.

Twelve plots of three rows in each experiment.

Amount of Fertilizer per Acre	Nitrate of Soda	Cost of Fertilizer less Nitrate Soda	Yield of Seed Cotton per Acre	Increase over no Fertilizer	Value of increased yield	Per cent profit from use of Fertilizer
400	22	$ 4.00	1735	281	$10.11	153
800	22	8.00	1890	436	15.69	96
1200	22	12.00	2042	588	21.17	76
.....	22	.....	1454	.....	.....	.....

V. S. BRIGHT, '07.

STUDIES IN THE LIFE HISTORY OF GUIGNARDIA BIDWELLII BLACK ROT OF THE GRAPE.

HISTORY.

The earliest authentic publications which refer to this disease were written by Batheam, Nicholas Longworth, and R. Buchanan, in the year 1848. It is not safe to say that this date was the time of the first discovery of the black rot; for black rot has existed for many years in the forests upon most of the wild species of vines from the Rocky Mountains to the Atlantic and from Canada to the Gulf of Mexico. We have, however, specimens of black rot collected by Curtis and Berkeley in 1850, which are the oldest on record. These two men named the black rot fungus Phoma uvicloa, and it is found still under the same name on berries collected in 1853 by Curtis and again in 1866 by Englemann. This proves beyond question that the black rot is of American origin. For not until 1885 does it appear in Europe. The disease was first introduced into France along with vines imported from North America to replace those destroyed by Phylloxera.

The early writers gave only imperfect descriptions of the black rot, for the disease was not well understood. It is common to designate all forms of decay of the grape berry, or of fruit of other plants, as "rot." So the early investigators distinguished this disease only by the color of the berries attacked, and not by its life history. When speaking of rot of grapes, American growers refer to black rot and not to the product of mildew or some other fungus. The common name rot is used in some writings to apply to black rot, as well as dry rot, gray rot, etc.

Synonomy.

Owing to the various stages of development of the black rot fungus, there have been a number of names applied to it. The synonymy of the species is as follows:

I. Guignardia Bidwellii (Ellis) (Viola and Ravay). Guignardia ampelicida. E. Rose.

II. Laestadia Bidwellii (P. Viala and L. Ravay). Physalespera Bidwellii, Saccardo. Sphaeria Bidwellii, Ellis.

III. Phoma uvicola varietas abruscae, Von Thumen. Phoma uvicola, Berkeley and Curtis. Sphaeropsis uvarum, Berkeley and Curtis. Phoma uvarum, Saccardo. Nemaspera ampelicida, Englemann.

IV. Phyllosticta labruscae, Von Thumen. Phyllesticta Viticola, Berkeley and Curtis. Phyllesticta Viticola, Von Thumen. Ascochyta Ellisii, Von Thumen. Sphaeria Viticola, Curtis. Sacidum Viticolum, Cooke. Phoma ustulatum, Berkeley and Curtis. Phyllosticta Ampelopsidis, Ellis and Martin. Sphaeropsis Ampelopsis, Curtis and Ellis. Phoma Ampelopsidis, Saccardo.

The specific name now generally accepted is Guignardia Bidwellii. Till within the last four or five years the black rot was known as Laestadia Bidwellii.

The fungus did not attract much attention until about the year 1885, when it began ravaging the vineyards. The disease increased very rapidly up to 1888, when it was found in almost all the vineyards of the South, except those composed of very young vines, bearing their first crop. The general distribution of the disease and the great losses it caused the grape growers brought it to the attention of botanists, who began the investigation of its cause. Prior to this date (1886) the disease had been attributed to the character of the soil, the atmosphere or to an enfeebled condition of the vines attacked. The first investigations did not associate the leaf stage of the disease with the fruit, but began their study of the fruit stage, for the fruit is the thing of value. It was soon established that both stages are the same and that the fungus attacks all parts of the vine except the roots.

Round of Life.

The time of appearance of the fungus on the leaves is from the middle of May to the last of June, while on the fruit it appears about the first of July to the middle of August. In France, Prunet found that there were several attacks of the fungus in a season, the periods of susceptibility being May 26, June 10 and 22, July 5 and 18, and August 1 and 17. The severity of the attack is estimated by the abundance of the spots on the leaves. In general, the disease increases rapidly in severity from the first to the third attack, after which it decreases slowly until about the fifth appearance, when it disappears quite rapidly. This same thing has been worked out by the American fruit growers, and the above data will hold equally as well here as in France. The time in the life history of the fungus when the maximum attacks on the leaves occur is about the time of the first invasion of the fruit. Taking into account climate, atmospheric conditions, etc., it may be stated that the most destructive attack on the leaves and young organs takes place about flowering time, and on the fruit about the time the grapes are the size of peas or half grown, though fully matured berries may be infected. On the former it occurs in June and on the latter in July, preceded by invasions of increased severity.

It is safe to say that any time between the middle of May and the last of June reddish brown spots of sharply defined outlines may appear on the leaves. These spots vary in size from one-eighth to one-fifth of an inch in diameter. They are best seen from the upper side of the leaf, though they can be seen from the under side. The spots vary in color from a

light brown in the center to a very dark brown or black at the edge, and on closer examination of the spots, numerous black pustules are seen.

The leaf spots as described could be confounded with others found on the leaf, due to the attacks of leaf blight, mildew, etc. The leaf blight resembles black rot in form and color of the spots, but differs in that there are no pustules. The leaf mildew does show upon the upper surface reddish brown spots, but these spots have mildew patches of white or grayish white color, and the outline is not so well defined as the black rot.

Scribner says: "The spotting of the leaves may make its appearance one to three weeks before the first appearance of rot on the berries." The first appearance of the rot on the fruit is a light brown spot caused by the decay of the underlying tissue. The spot is small at first, but gradually grows larger until the whole berry is covered. The disease does not extend from one berry to another by contact or through the pedicel, but there is a distinct infection for every berry. As the disease advances, the berry first turns brown, then black, and becomes covered by minute black pustules. Finally, the entire berry dries and shrivels, the skin crumpling into angular folds around the seed. The berry either falls off or remains on the vine till the next spring, to renew the disease.

Spore Formation.

Now, if a section of the diseased berry is examined under the microscope, minute threads growing into and between the cells will be seen. These threads are the vegetative portions of the fungus and are called hyphae. These minute threads vary in diameter from .001 to .005 of an inch, having frequent cross walls and containing a clear granular fluid (protoplasm).

The hyphae collect into little knots under the cuticle of a diseased berry, which, by development, form black pustules called pycnidia. There are two kinds of pycnidia, one which is produced generally in the spring, and one which develops in the later stage of the disease, though it may appear in the spring. The former is a round, thick walled body, having long, slender threads converging to the center, to which are attached minute rod-like bodies called stylospores. This form of the pycnidia has been termed spermagonia by some authors and the spores called spermatia. In the latter form of pycnidia, the walls are not so thick, and the stylospores are more elliptical in shape. The spores escape through an opening or pore in the summit of the pycnidium in a mass of threads. These masses of threads are held together by a sticky substance which is easily dissolved by the rain or moisture. Those that happen to be carried onto the damp surface of a grape berry or leaf germinate at once, sending out thread-like processes or germ tubes. The germ tube readily penetrates the cuticle and by ramifying through the tissue, produces the disease.

Pycnidia can be produced in a very short time under suitable conditions of moisture and temperature. Scribner produced them on unaffected berries in five or six days. These spores germinating in the spring

on the green portions of the vine, form the first or primary attack of the black rot. The attack which arises from the development on the grape leaves of the spores that attack the berries is called the secondary. The time of the different invasions has been worked out by French grape growers. The first seems to occur between April 20 and 25. The second attack occurs at different intervals during the growing season. The length of the period of growth for the several attacks depends largely upon the temperature. In general, it is from sixteen to twenty days in April and May, fourteen to sixteen days in June, and ten to fourteen days in July and August.

There are sometimes found on berries having the pycnidia, knotty masses of tissue identical with that which forms the walls of the pycnidia, the difference being that the cells of the walls are more distended. These bodies are called sclerotia, and under favorable conditions they have a number of erect stalks bearing oval spores called conidia, which perform the function of propagating the black rot. The discovery of these sclerotia was made by Erwin F. Smith and afterwards studied by Scribner, Viala and Ravaz, who all testified to its presence. But it only occurs on berries that are very favorably situated. This accounts for the less frequent appearance of this stage of the fungus.

In May or early June, one may find on diseased berries of the preceding year, pustules somewhat larger than the ordinary pycnidia, but otherwise much like them; these are the perithicia. They are formed from the old pycnidia, which carry the disease through the winter. Upon examining a section of the perithecium under the microscope, numerous club-shaped sacs will be seen called asci. Each ascus contains eight irregular, oval-shaped spores, called ascospores. Scribner says that as soon as the ascospores are developed, the slightest moisture on the asci causes them to swell and rupture. The pressure produced is sufficient to throw the asci to a height of an inch or more. The ascospores thus forced into the air, are taken up by the slightest wind and carried to the neighboring vines, where they germinate, causing the disease in eight to twelve days.

In 1880, Dr. E. C. Bidwell, of Newfield, New Jersey, first discovered the perithecia upon berries killed the previous season and still hanging on the vines. I found undeveloped asci on diseased berries collected near Knoxville on February 7, 1907. The first well developed asci which I found were taken from diseased berries collected from the University Experiment Farm on Friday, April 11, 1907. Mr. Bidwell was never able to find asci with ascospores formed before May, while I found them about the middle of April. Their early development was probably caused by the warm moist weather during the last of March and first of April.

By the above description it is shown that the black rot fungus is reproduced by several different kinds of fruiting bodies which are seen as pustules upon diseased leaves and berries at different times during the growing season. They are known as pycnidia, spermagonia, sclerotia and perithecia. Associated with the above fruiting bodies there are different

spores. (a) In the pycnidia, the stylospores; (b) on the sclerotia, the conidia; and (c) in the perithecia, the ascospores. All of the above spores are capable of originating the disease in unaffected parts of the same vine or of others in its neighborhood.

TREATMENT OF BLACK ROT.

Bagging.

Although black rot had ravaged the vineyards of North America for many years, no systematic attempt was made to prevent the disease except bagging the fruit or destroying the affected berries. Bagging the fruit as a means of preventing the rot first began to be extensively practised in the seventies, and there is no doubt that when properly done, it is still the safest and most trustworthy method of saving the fruit. The only drawback to bagging is the cost, which must necessarily be considerable, as each bunch, in order to be made secure, must have a bag fastened over it, and, when the fruit is gathered, this bag must be removed. All of this, of course, consumes time, and time is money in this case, as well as in any other. When a man has a few choice varieties that he wishes to preserve for table use, it would probably pay him to bag the fruit, but if he grows extensively, this plan is impracticable.

At the time bagging first began to be practiced, grape growers, as a rule, recognized the fact that black rot was a fungous disease due to outside influences and not brought about by any diseased conditions of the plant, as was formerly supposed. At first, it was the practice to put on the bags as soon as the spots appeared, but experience soon showed that to preserve the fruit, it was necessary to enclose the clusters shortly after the opening of the flower.

It is not necessary here to go into the details of the many investigations and experiments made by the different workers on the treatment of rot by means of bags. As shown above, these experiments have proved that the disease is due to a parasitic fungus, growing within the tissues of the berry and that the fungus is carried by spores that are always ready to infect other vines in the vineyard when suitable conditions exist. The method of transmittal of the fungus once determined, it was readily understood why bagging prevents rot, as by this process spores are excluded and infection rendered impossible. The question now arose whether there is not some substance or substances which, applied to the fruit, will prevent the spores from germinating, or destroy them entirely, thereby preventing the infection in the same manner as with bags. The successful solution of this problem demanded that various conditions be fulfilled. It was necessary that the substance used should not injure either fruit or foliage, that it should be cheap, easy of application, and that it should not render the fruit unfit for eating or marketing.

Bordeaux Mixture.

In 1882, Millardet brought to light the accidental discovery of the Bordeaux mixture. This discovery was made by a vineyardist who sprin-

kled vines bordering a roadside with bluestone and lime in order to prevent the stealing of the fruit. It not only prevented the stealing, but saved the fruit from mildew. The good results obtained from a series of experiments with Bordeaux and other copper mixtures in the treatment of mildew was sufficient reason for giving the preparations a thorough trial for the black rot. The success of the treatment of mildew in France was noted in this country by the Department of Agriculture.

About 1887 there was carried out a series of experiments in vineyards scattered over the country, which proved conclusively that the Bordeaux mixture is the remedy for black rot. In treating vines for black rot the following conclusions may be drawn: First, it pays to treat the vines for black rot, for from forty to sixty per cent. of the crop is saved; second, the best preventive, all things considered, is the Bordeaux mixture containing 6 pounds of copper sulphate, 4 pounds of lime and 22 gallons of water; third, as the amount of copper in Bordeaux mixture decreases, its value as a preventive is lessened.

Other Remedies.

There are often used, in place of the Bordeaux, other mixtures, all of which have some copper salt as a basis. The most important of these remedies are: (1) the simple copper salt solution containing 1 pound of pure sulphate of copper in 25 gallons of water. (2) Bordeaux mixture, sulphate of copper, 6 pounds; quick lime, 4 pounds; water, 50 gallons. (3) Ammoniacal solution of copper carbonate, consisting of carbonate of copper, 5 ounces; strong aqua ammoniae, 3 pints; water, 45 gallons. (4) Eau celeste, having sulphate of copper, 2 pounds; ammoniae, 3 pints; water, 50 gallons.

Besides the above standard remedies, there are many modifications of the same, as well as other remedies of slight importance now in use. Some of the latter remedies are: (1) copper acetate. This consists of subacetate of copper, 5 ounces; water 26 gallons. (2) Potassium sulphide, having sulphide of potassium, 1 ounce; water, 2 gallons. (3) David's powder, 4 pounds of copper sulphate dissolved in the least water it takes to dissolve, adding 16 pounds of lime, which is dried before applying. (4) Sulphatine. Mix $2\frac{1}{2}$ pounds of anhydrous sulphate of copper, 15 pounds of sulphur and 10 pounds of air-slacked lime.

It is important to remember that in the treatment of this disease no fungicide can kill the black rot when it has effected an entrance into the tissue of the plant or berry. The value of the remedy is wholly as a preventive. Another important thing, too, is to apply the spray to all portions of the vine, for if the whole vine is not covered with a film of the fungicide, a spore lighting on that portion may enter the tissue as easily as if no spraying had been done.

In spraying the vine, there are several things to be considered. With vines that have been attacked the previous year, it is well to remove all prunings and weeds from the immediate vicinity, before the buds start, and burn them. Before the buds open, the vines should be sprayed to

catch the spores then on the vines. Before the grapes come into blossom, the vines should again be sprayed to protect the new growth against attack. The blossoming period lasts ten days or two weeks, so no spraying should be done during this period. After the blossoming season, spray carefully to moisten all parts of the foliage above and below and repeat the spraying at intervals of two weeks till the last of July or middle of August, or until all danger of infection is past.

The following are some of the principle objections to the use of the Bordeaux mixture in spraying vines and experiments proving that these objections are groundless: (1) Cost of spraying. The cost of treating a vineyard of 1,206 vines was as follows: 100 pounds of copper sulphate, $7.50; 1 barrel of slacked lime, $1.10; to which add cost of labor, etc., and the total cost was $12.50, or one cent per vine. Before spraying, only 250 pounds of first-class fruit was taken off the vines; after spraying, 2,953 pounds of the very best fruit was gathered, which sold at a price that greatly exceeded all cost of production. It has been estimated that the cost of spraying an acre of vines is between $5.50 and $7.00.

(2) Danger to health.—Many analyses of berries having Bordeaux mixture on them have been made to determine this question. The following analysis proves that there is no danger: Two and a half pounds of fruit, including the stems, showing the mixture more plainly than grapes which would be on the market, were weighed, dried and analyzed. On the basis of results obtained, every pound of grapes treated with Bordeaux mixture contained .035 of a grain of copper. An adult can take from 8 to 12 grains of this salt without fear of serious results, and to get this amount from sprayed grapes, he would have to eat from one to one and a half tons of fruit. The minimum amount of copper introduced into the human system daily through the food is 1 milligram, a trifle less than one-half of that necessarily taken with each pound of fruit, stem and all. By using ammonia copper carbonate, which contains one-thirty-second as much copper as Bordeaux mixture, for the last three sprayings, there can be no danger. Moreover, the bunches that have crusts of Bordeaux mixture may be cleaned, if desired, with a weak solution of vinegar, 2 quarts to 10 gallons of water. The apparatus used is a circular wire basket, 20 inches in diameter and 11 inches deep; three tubs, one of diluted vinegar and others of water; three or four frames from a fruit evaporator. Soak the bunches in the solution a few minutes, rinse in the clean water and dry on the frames. By the above, I think it is shown that the objections to the use of Bordeaux mixture are groundless, and that no bad results are likely to occur in the proper use of this or any other fungicide.

Spraying Calendar for Black Rot.

Many stations have worked out spraying calendars for black rot. The Cornell spray calendar for black rot is as follows: (1) As soon as first leaves are fully expanded, Bordeaux mixture; (2)after fruit is set, Bordeaux mixture; (3) repeat at intervals of two or three weeks until fruit is three-fourths grown; (4) ammoniacal copper carbonate when fruit

PLATE I.—SPORES AND THEIR GERMINATION.

PLATE I.

Fig. 1. The drawing represents spores upon condiophores which are attached together at the base. B shows large spores with smaller ones attached at one or both ends.

Fig. 2. Shows several spores after the first twenty-four hours growth in the agar medium. They were taken from various slides that were used in one of the sets of experiments, the intention being to show the growth of the spores as they developed from day to day. But because of mold, the slides were rendered useless, so I abandoned the idea after the second day.

Fig. 3. This drawing shows three spores after the second day's growth taken from the same set of slides as Fig. 2. They show very well the branching and cross walls of the filaments. A in the same drawing shows a tip of a filament producing spores after the second day's growth.

is nearly grown; (5), (6), etc., repeated at intervals of seven to fourteen days, as required. Iowa spraying calendar: Bordeaux mixture. (1) When the leaves are one-third grown; (2) just before blossoms open; (3) just after fruit sets; (4) ten to twenty days after (3); (5) ten to twenty days after (4). The time of spraying may differ in different states, owing to conditions.

Editor's Note.—The remainder of Mr. Fuller's thesis is devoted to experiments in germinating the spores of Guignardia Bidwellii and in inoculating grape foliage with the disease. Owing to its technical character, this work would not prove of interest to the general reader, and partly for this reason and partly from lack of space, it is omitted. It gives results of twenty-nine experiments, covering the time from February 4 to May 29, of the present year. The portion of the thesis printed above is based upon a careful reading of over a hundred references (all of which are named in a bibliography included in the thesis), but this is a work of compilation, not dissimilar from what would be done with any purely literary theme. The original work, embraced in the experiments referred to is of entirely different character, and from it the student acquires, by his own investigations, a familiarity with the subject in hand, comparable to the knowledge of crops which a farmer gains in cultivating them.

Mr. Fuller planted the spores of black rot in media prepared by himself. The plate of illustrations herewith shows the ripe spores and the extent of their growth in one and two days, with a spore-bearing filament two days old, indicating the exceedingly rapid reproduction of the fungus, and accounting for its quick spread under favorable conditions in the vineyard.

Twenty-nine such cultures were undertaken in the course of this investigation, each being carefully studied under the microscope, and in the course of the work ten sheets of drawings were made similar in nature to the one presented herewith, representing eighty-six subjects. These data are given, that the reader may have some idea of the extent and kind of work in subjects of this character.

E. F. FULLER, '07.

EDITORIAL.

IN REVIEW.

With this issue, Volume I of the U. T. Farmer is completed. Though the magazine may not have accomplished all that some of its friends could have hoped for, it completes its first roll in the full vigor of youth and with bright prospects planned for the future.

This publication has been of great value to the students, serving to unite their interests in a common enterprise and to give them most helpful practice in the expression of their ideas in print. It has had the loyal support of the agricultural faculty whenever they were called upon, but has never been dominated by them. So that from the start it has been in reality, as well as in name, a student publication.

Though responses from farmers and business men of the state have not been numerous, they have not been lacking in spirit. Several farmers have kindly contributed carefully written and valuable articles for the magazine, and none other than words of good will have come from the world away from the campus.

IN FORECAST.

So it is with just emulation that the U. T. Farmer purposes, guided by a new staff, to present itself to the public as Volume II during the session of 1907-08. The staff is as follows:

A. T. Anders ..... Editor-inChief.
Herman Work ..... Associate Editor.
W. M. Landess ..... Business Manager.
L. R. Neel ..... Alumni Editor.

The rest of the staff will be appointed before the next session begins.

Due to the experience of the past nine months, the U. T. Farmer may reasonably be expected to appear in greater strength next session.

Since the students have had experience in writing for publication, they will do so next fall with more confidence and readiness; and as the alumni are becoming thoroughly interested in this publication of their Alma Mater, and since an Alumni Department has been created, liberal contributions are expected from this source hereafter.

As the magazine is now pretty generally known and appreciated, and since those who subscribe for it next session may be assured that they will obtain all of the numbers that the contract calls for, a great many more subscribers are expected. In order to increase the circulation and to place the U. T. Farmer at a price that is not high as compared with other agricultural publications, the management has decided to offer it for the nine months of the University session of 1907-08 at fifty cents. This reduction will necessitate an increase in the circulation or the magazine will suffer financially, so its friends are urged to solicit and send in subscriptions during the summer and early fall.

STUDENTS' THESES.

In this issue the three theses of the Agricultural Seniors are published, either entire or in part. They have been printed because they contain information that is instructive and practical; also because they give some conception of the amount and quality of work necessary in the preparation of a thesis.

The thesis on black rot is not published entire, for the reasons given in the editorial note. It represents a large amount of careful and painstaking work. The author spent from a few minutes to several hours in the laboratory on practically every day of the winter and spring terms of the session, in addition to reading hundreds of pages of literature on black rot.

The thesis on the culture and improvement of cotton was treated in two parts, only one of which is printed, and that in an abridged form. The other part will follow next fall. The part devoted to the culture of cotton has been edited considerably, as much of its contents was of a nature too technical for a popular publication. This thesis was written after the author had read the most important literature on the subject, had made a histological study of the plant in the laboratory and had cross polinated a large number of plants in the field and made numerous observations.

The article on bud variation of the Irish potato is entirely the result of field observations. Only a very small part of the records and notes made could be used, as is always the case in such work. Many of the conclusions drawn in this article are tentative on account of the short time through which the experiment ran, but all are entirely logical in the light of the data at hand.

THE FARMERS' CONVENTION.

The East Tennessee Farmers' Convention, held at the University, May 22-24, was a marked success. About a thousand members paid their dues and many others attended all or part of the sessions.

During the three days' program, not a single tiresome speech was heard; all were carefully prepared and were full of practical value. The audience was attentive from the beginning to the end.

To the agricultural students the Farmers' Convention was a rare treat. It was an opportunity to be among the representative farmers of East Tennessee and to hear some of the agricultural leaders of this and other states.

As a recognition of the eminent service rendered the Farmers' Convention and Institute by Commissioner Ogilvie, a handsome silver cup was presented him.

Mr. W. T. Roberts, a successful dairy farmer of McMinn county, was elected president, to succeed Captain H. B. Clay, of Hawkins county. Prof. H. H. Morgan was retained as secretary, to be assisted by Mr. S. E. Barnes.

As the speeches have been given more fully in the daily papers and in several agricultural publications than space would allow in the U. T. Farmer, only the speakers and subjects will be printed, as they appeared on the program:

Call to order by the President, H. B. Clay.

Address of Welcome—Dr. Brown Ayres, President of the University of Tennessee, Knoxville.

Response—Hon. John Thompson, Commissioner of Agriculture-elect, Nashville, Tenn.

President's Address.

"The Dairy Cow"—Selection, Breeding, Development and Care—H. B. Gurler, De Kalb, Ill.

Discussion—"The Feeding of the Dairy Herd"—D. C. Young, Sweetwater, Tenn. "The Testing of Dairy Cows"—S. E. Barnes, Knoxville, Tenn.

"The Dairy Short Course"—D. W. Duncan, Tasso, Tenn.

"Rural Public Schools"—Prof. R. L. Jones, State Superintendent of Public Instruction.

"Corn Seed Selection and Cultivation"—Prof. P. G. Holden, Ames, Iowa.

"The Relations the Railroads Sustain to the People"—Col. Robt. Gates, Industrial Agent of L. & N. R. R.

"Immigration"—Col. M. V. Richards, Industrial Agent of Southern Railway.

"Soil Fertility Problems"—Alva Agee, Wooster, Ohio.

"Building Up Worn-out Lands"—Clarendon Davis, Huntsville, Ala.

Road Building Demonstration—King Road Drag.

"Farm Management"—Prof. W. J. Spillman, U. S. Department of Agriculture, Washington, D. C.

"Breeding, Feeding and Marketing Live Stock"—W. S. Porter, Petersburg, Tenn.

"Breeding and Feeding Mules"—Henry W. Clark, Wartrace, Tenn.

"Building Roads Without Money"—D. W. King, Maitland, Mo.

Address—Gov. M. R. Patterson.

"Modern Conveniences for Farm Homes (Demonstrated)—Miss A. M. Gilchrist, University of Tennessee, Knoxville.

PERSONALS.

The Experiment Station had a very pleasant visit recently from two workers in the the Bureau of Plant Industry, U. S. Department of Agriculture, Messrs. Derr and Warburton. Mr. Derr is working upon the history and classification of barleys and Mr. Warburton on oats.

Mr. J. E. Converse, who is engaged in Middle Tennessee in connection with the Co-operative Experiment Station work, is to be married to Miss Mooney, of Knoxville, on June 26th.

Gov. M. R. Patterson visited the University on the occasion of the East Tennessee Farmers' Convention and the Centennial of the University of Tennessee.

Mr. L. R. Neel will spend the summer on the farm with his people in West Virginia.

Mr. A. T. Anders is slated to assist Prof. Butler in nursery inspection.

Mr. Cotton has been busy erecting large screen cages (we would call them houses), in which he expects to conduct some interesting experiments with the peach borer this summer.

Profs. Bain and Keffer visited the mountains recently. The former went in the interest of some cotton experiments and the latter for recreation.

Mr. Hermann Work is conducting some interesting cotton tests for Prof. Bain in the mountains of East Tennessee.

Shofner & Hix will spend the summer in the harvest fields of their fathers in Middle Tennessee.

T. W. Henders contemplates a visit to Ohio, after which he expects to work in the dairy of the Experiment Station.

A. Jackson expects to take some practical agriculture on the farm this summer.

Prof. Bentley will leave shortly for Great Barington on a short visit to relatives and friends.

Prof. Mooers has been busy mapping out some experiments in crops, rotations, fertilizers, etc., in Middle Tennessee.

A. W. Barr will work with Prof. Bain on clover immunization experiments.

We were glad to see Mr. Porter, of Petersburg, and Mr. Clark, of Wartrace, at the University during the East Tennessee Farmers' Convention and Institute. They are always welcome visitors among the agricultural students.

The farmers of East Tennessee presented Mr. Ogilvie, the retiring Commissioner of Agriculture, with a beautiful silver pitcher at the recent Farmers' Convention.

Mr. Louis Christman, '09, will spend the summer at Jackson, Tenn., and W. C. Johnson will assist his father in horticultural work in Memphis.

Mr. E. F. Fuller, a graduate of the University in Agriculture this year, expects to go back to the farm at Morristown, Tenn.

U. T. FARMER

Up for the Prize at the State Fair.

Vol. I No. 2

NOVEMBER, 1906

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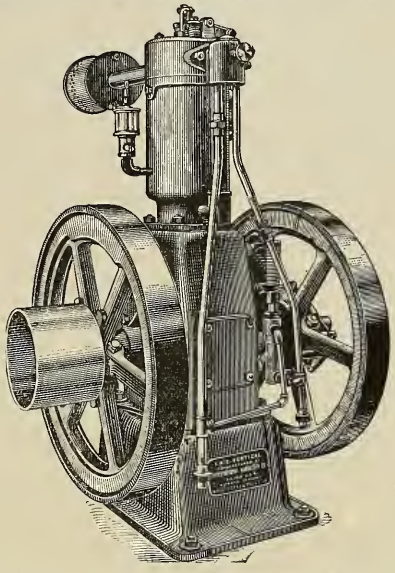

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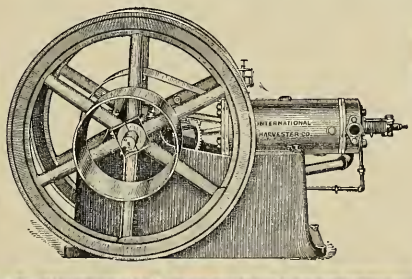

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Tennessee River Bottom, Agricultural Experiment Station, University of Tennesse.

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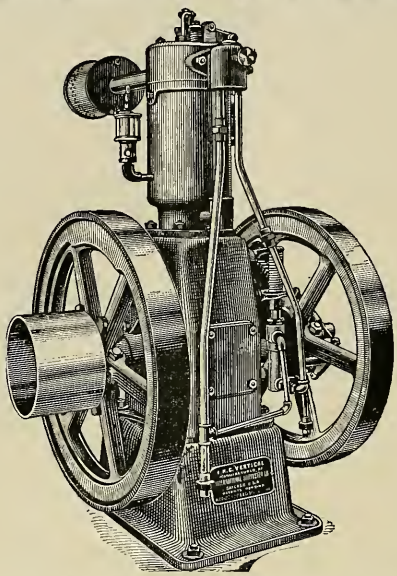

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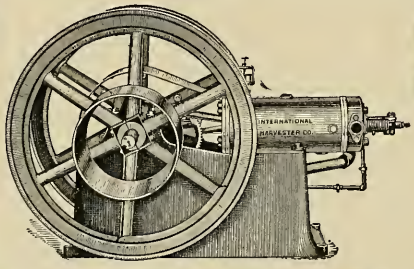

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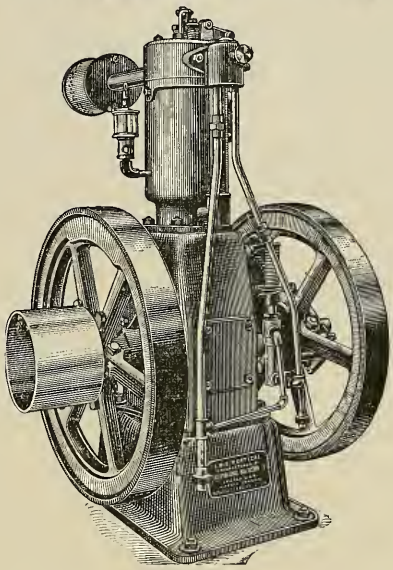

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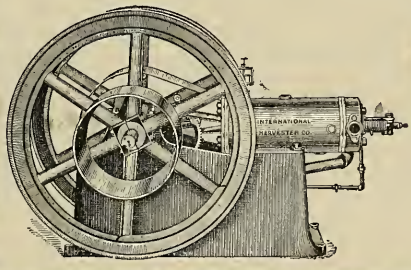

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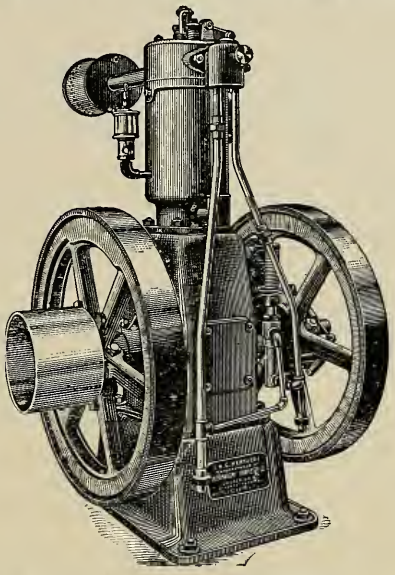

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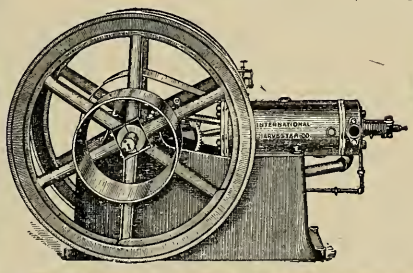

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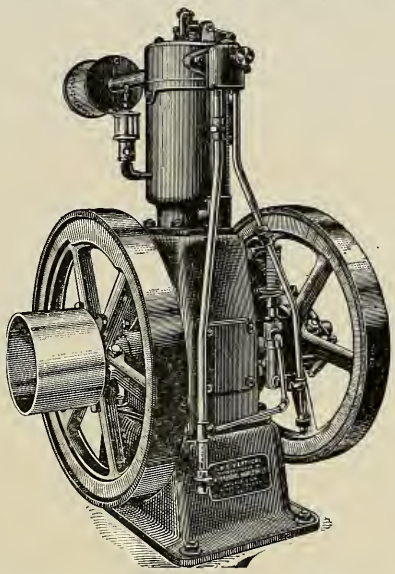

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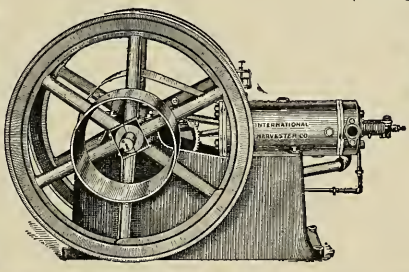

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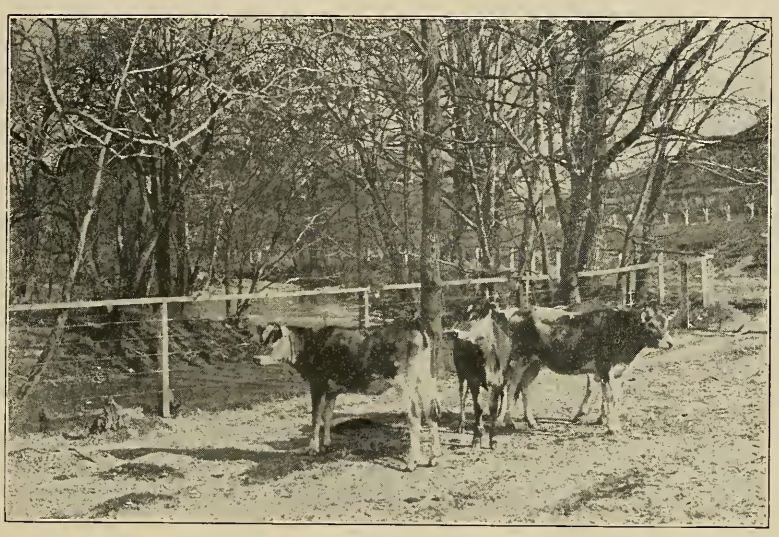

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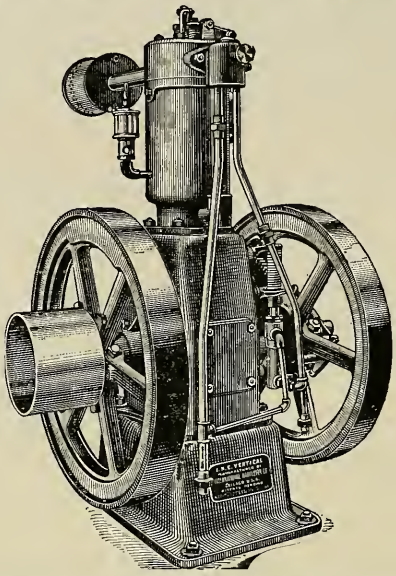

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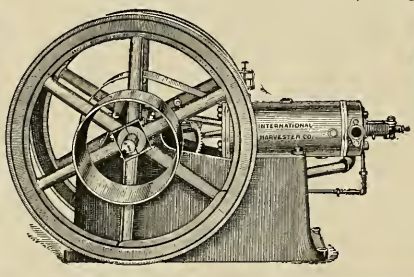

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WHERE THE EAST TENNESSEE FARMERS' INSTITUTE MEETS.

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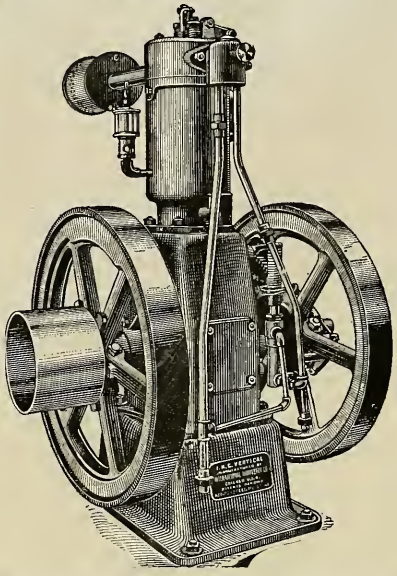

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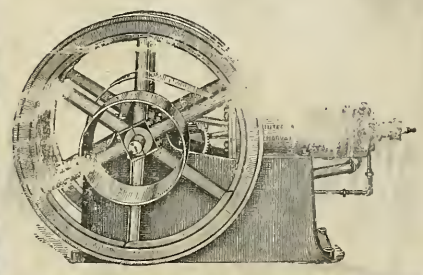

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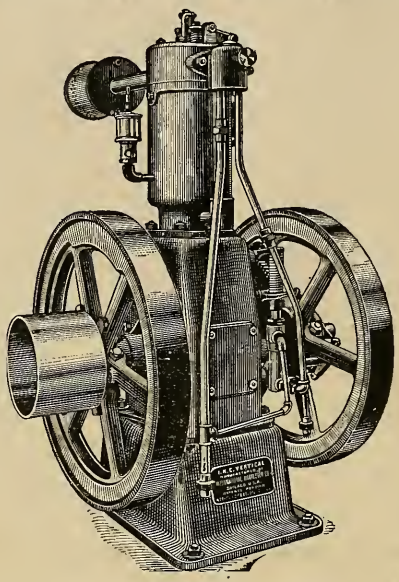

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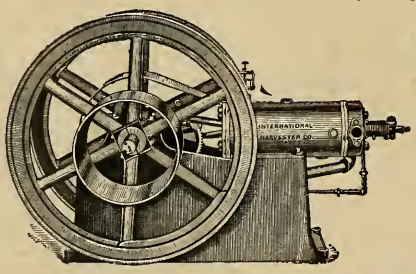

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